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POVERTY CONDITIONS AND PATTERNS OF CONSUMPTION: AN ENGEL FUNCTION ANALYSIS IN EAST JAVA AND BALI, INDONESIA

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ABSTRACT

This paper aims to analyze consumption patterns of various household goods. The data used in this study was sourced from results of household surveys in the East Java and Bali Provinces in Indonesia. The analytical model used to evaluate household consumption patterns was the Engel function. Engel's function model maps the level of consumption to household income. In this study, the explanatory variables used include household expenditure levels, household characteristics and household poverty conditions. The results showed that the consumption of staple foodstuffs was relatively inelastic in terms of an increasing household expenditure. Moreover, the consumption of processed food is relatively more elastic in terms of expenditure. The study also found that poor households have a different consumption pattern in comparison to non-poor households. Poor households allocate less income to basic necessities that are important for health, such as vegetables, meat and fish. The implication is that government assistance for poor households must be accompanied by education on healthy consumption patterns.

Contribution/ Originality: This study is one of the few studies examining household consumption patterns and their relationship with household welfare and poverty indicators in developing countries. This research is a preliminary study that uses poverty rates of poor households based on indicators of government assistance in the form of financial aid.

1. INTRODUCTION

Development is a multidimensional process that involves fundamental changes to social structures, community attitudes, national institutions, overcoming income problems, poverty alleviation, and the optimization of accelerated economic growth. One of the indicators of economic development that can be used to measure household welfare is the level of poverty in a country. In several developing countries, including Indonesia, the poverty rate is a wide-reaching problem. Poverty levels are often not in line with regional economic performance; in other words, regions with better economic levels do not necessarily have low poverty levels. In contrast, regions with low poverty levels have a mediocre economic performance. The East Java Province can be said to be an area

that has a significant economic contribution. In 2014, its Gross Regional Domestic Product (GRDP) reached around 14.18% of the total national Gross Domestic Product (GDP). However, the poverty rate in East Java is still relatively high (12.28%). Meanwhile, the Bali Province, with a GDP contribution of 1.46% of national production, has a relatively low poverty rate of 4.76% (Central Bureau of Statistics, 2019). In brief, a high aggregate income does not guarantee a low level of poverty. Household welfare is not only seen in terms of total expenditure, as it can also be evaluated based on existing consumption patterns.

A significant amount of research has been carried out on consumption patterns. One of the methods used in such studies is the Engel function approach. Conceptually, Engel's function analysis links the level of income to various types of consumption expenditure. Engel's mathematical model (Vogel, 2005) has become a reference point when developing empirical models. In general, there are two ways to approach Engel's function analysis—macro-aggregate and micro-disaggregate. During its development, Engel's approach was also used to evaluate welfare levels. Sabirova and Khasanova (2015) found that the use of the Engel curve and the fuzzy set theory confirms that the Republic of Tatarstan is relatively prosperous. Other research has found that China's extraordinary economic performance over the past few decades can be evaluated using Engel's approach (Nakamura, Steinsson, & Liu, 2016). The aggregate data approach of the Engel function has problems in terms of spatially disaggregating price data (Gibson, Le, & Kim, 2017; Hyun & Kim, 2017). Due to limitations in the use of aggregate data, some researchers also used a micro data approach when estimating the Engel Curve.

Micro data can be used in several ways. First, it can be used to partially estimate consumption patterns. Choudhury et al. (2020) estimated the consumption pattern of fruits and vegetables in India. The same study was carried out by Gustavsen and Hegnes (2020) for the consumption of organic food in Sweden using personality variables. Second, it can be used to simultaneously estimate household consumption patterns for several different types of consumption. In this approach, household consumption data are used alongside household characteristics, including education levels, marital status, household status, and the number of household members. This research model was applied in Slovakia to examine the relationship between household characteristics and the consumption of various goods (Benda-Prokeinová, Dobeš, Mura, & Buleca, 2017). This research did not explicitly address the problem of poverty. Furthermore, Colen et al. (2018) used meta-analysis in 66 studies of consumption patterns in Africa. Researchers suggest the importance of promoting and encouraging nutrition in government assistance programs. Research on household consumption patterns in Nepal differentiated the consumption behaviors of low-income households and high-income households (Khanal, Banskota, & Giri, 2018). Research into consumption patterns that specifically analyzes the behavior of poor households has been carried out in Rwanda using micro data (Nsabimana, Bali, Surry, & Ngabitsinze, 2020). However, this study does not make comparisons between households in other groups and does not use policy variables as indicators of poverty.

Based on previous research studies, several research gaps can be found. First, research on consumption patterns that use the Engel function approach employ separate data sets: macro-aggregate or micro-individual data. Second, research on household consumption patterns has not utilized anti-poverty policy variables. To fill this research gap, this research has two main objectives. First, to analyze consumption patterns using a combination of regional level macro data and household level micro data. Second, to analyze the consumption pattern of poor households receiving government assistance, compared to other households.

2. LITERATURE REVIEW

The issue of poverty is one of the most important research topics in terms of welfare in developing countries, including Indonesia. Comprehensively, research on poverty in Indonesia can be viewed from various perspectives (Hanandita & Tampubolon, 2016). Studies on poverty in Indonesia have been carried out using limited samples in places such as the Bone District (Wekke & Cahaya, 2015) and several regions in East Java (Aji, 2016; Raharto, 2016). In general, it can be concluded that studies on poverty cannot be viewed from only one perspective, such as

the economy. However, in a more in-depth study, only looking at one area is sufficient to analyze many factors. In this paper, researchers used two sample cases that have different characteristics: East Java and Bali.

Several issues have been linked to poverty levels. One of them is the relationship between poverty and entrepreneurship (Hadi, Wekke, & Cahaya, 2015). In a broader context, this issue can also be evaluated from the point of view of human resource development (Olopade, Okodua, Oladosun, & Asaleye, 2019). Studies on welfare in several countries have also been associated with the problem of saving habits (Tuong & Duc, 2020) and industrial development (Thi & Trung, 2020). Poverty alleviation strategies using qualitative and quantitative approaches are a concern in development analysis (Islam et al., 2020). From a macroeconomic perspective, this welfare issue can be seen through financial properties (Ngatno & Apriatni, 2020) and monetary policies (Houcine, Abdelkader, & Lachi, 2020). Ultimately, many factors can be related to the problem of poverty, and the research in this paper examines poverty from both a macro and micro perspective.

One recent research development is the examination of the relationship between welfare and consumption patterns. However, initial research studies are still carried out in a relatively limited way (Lestari, Hanim, Listyaningsih, & Supriyadi, 2017). An understanding of sustainable consumption patterns is the main aspect of this research (Purnomo & Kurnia, 2019). A comparative analysis of consumption patterns in poor households has been carried out in Jakarta, Delhi, and Quita (Diehl, Oviatt, Chandra, & Kaur, 2019). Following recent developments, research into consumption patterns has become one of the most interesting research areas in welfare studies in various countries (Bakkeli, 2020). The relationship between consumption patterns and welfare is integrated into research on poverty. This paper looks directly at the relationship between consumption patterns and poverty levels.

Research on consumption patterns in Indonesia has been carried out using both macroeconomic and microeconomic approaches. At the macro level, consumption patterns of electricity and the internet are associated with economic growth (Amaluddin, 2020). On a micro level, household consumption patterns are associated with socioeconomic status (Rusdiana, Subandi, & Mulyawan, 2020). Micro research with a broad perspective has also been carried out in Indonesia using samples from five big cities (Seda, Setyawati, Tirta, & Nobel, 2020). The results showed that consumption patterns were influenced by the religious and cultural values of the local community. The analysis of household micro data in this study used detailed determinants of consumption, including education levels, marital status, employment status, and the number of household members.

Based on discussions in previous studies, several significant points must be noted. First, research on consumption patterns is an area of study that is still growing. Thus, several interesting aspects can be used as a focus in the research. Second, the study of consumption patterns is also related to welfare levels, as illustrated by Engel's function in microeconomics. However, this study focuses on poverty as an important determinant of consumption patterns. Third, previous studies have not carried out in-depth analyses on consumption patterns of households receiving aid or anti-poverty programs. This research gap is significant in terms of the contribution of this study.

As an illustration, the pattern of household consumption can be described using a scheme such as the following:

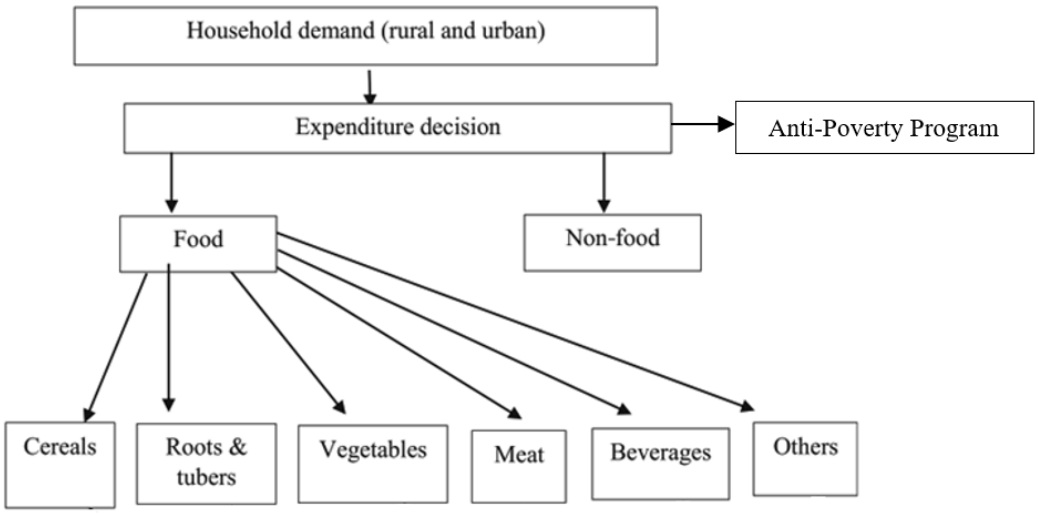

Figure 1. Household consumption patterns and anti-poverty programs.
Source: Nsabimana et al. (2020).

Figure 1 shows the framework of this research, which was modified from empirical research in Rwanda (Nsabimana et al., 2020). Household consumption demand is a reflection of household decisions on expenditure allocation. In general, there are two types of household expenditure: Food and non-food. Theoretically, determining expenditure allocations is affected by several factors. Conventionally, the factors that determine consumption expenditure are price, income, and taste.

The factor of taste is subjective in nature and is determined by many considerations, including household characteristics and other factors that have an indirect influence, such as culture, religion and regional environmental factors. In theory, policy factors can also influence consumption decisions. Households that receive governmental assistance in the form of cash or food can reallocate their expenses according to their respective preferences. Such government assistance programs are expected to increase a household's income so that household expenditures are reallocated to other forms of consumption, both food and non-food. This reallocation is expected to improve household welfare.

Formally, household consumption decisions can be formulated using a mathematical model. The objectives of the household are to maximize utility in the following forms:

$$U = f(x_1, x_2, \ldots . x_n) \quad (1)$$

Equation 1 is the utility function for each household. U represents utility and x_1 through x_n represents the miscellaneous consumer good. In order to achieve maximum utility, households face the following budget constraints:

$$M = P_1 x_1 + P_2 x_2 + \cdots + P_n x_n \quad (2)$$

Equation 2 presents the budget constraints of households. This function shows the limit of the total expenditure that can be carried out by a particular household. M represents household income and P_1 to P_n represents the price level for each item, according to the sequence number. Lagrange's solution for this instance can be formulated as follows:

$$L = f(x_1, x_2, \ldots x_n) + \lambda(M - P_1 x_1 - P_2 x_2 - \cdots - P_n x_n) \quad (3)$$

Equation 3 is Lagrange's equation for household decisions. The optimum value of the L function can be obtained by performing standard optimization techniques. The first derivative of function (3) is set to zero and the equilibrium value will be obtained when:

$$MUx_1/P_1 = MUx_2/P_2 = \cdots = MUx_n/P_n \quad (4)$$

Equation 4 is the equilibrium condition for household consumption. In this case, MUx_1 represents additional utility due to the additional consumption of good x_1 and other goods. The process of derivation to achieve the optimal function value will produce the goods equation x_1, which is expressed as a function of other goods and all prices of goods. Through the substitution process for the constraint in Equation 2, the Marshallian function for the consumption of goods will be obtained as follows:

$$x_1 = h_1(M, P_1, P_2, \ldots, P_n, x_2, x_3, \ldots, x_n)$$

$$x_2 = h_2(M, P_1, P_2, \ldots, P_n, x_1, x_3, \ldots, x_n)$$

.....

$$x_n = h_n(M, P_1, P_2, \ldots, P_n, x_1, x_2, \ldots, x_{n-1}) \quad (5)$$

Equation 5 is a demand equation for consumer goods. In the context of the relationship between the consumption of each item and income levels, Engel's function will form the basis of the estimation model used in this study. In the empirical model, Engel's function will include certain variations, including the form of the function and the addition of other relevant explanatory variables. Several variables that can be included as explanatory variables are education levels, marital status, the age of the head of the household, employment status, the number of household members, and other aspects related to regional characteristics. In this study, the poverty rate variable is represented by the anti-poverty program indicator.

3. METHODS

3.1. Data

Two types of data were used in this study: Aggregate macro data and household micro data. The aggregate macro data consisted of consumption data and other supporting data calculated in terms of city and regional units. Household micro data was calculated according to household analysis units without being accumulated into a broader level of analysis. This research was conducted in two different places: East Java and Bali. The data used in East Java was aggregated macro data, and the data used in Bali was household micro data consisting of data on expenditures for various foods.

The East Java consumption data was obtained from the Central Statistics Agency (BPS) of the East Java Province. Data used included: (1) The average monthly food expenditure per capita by regions/cities in the East Java Province in 2014; (2) The total population of the East Java Province according to regions/cities in 2014; (3) The percentage of poor people in districts/cities in East Java in 2014; (4) The literacy rate in regions/cities in East Java in 2014; (5) The life expectancy in the East Java Province in districts/cities in 2014 and; (6) The income per-capita in the East Java Province by district/city. Data on the consumption of staple goods consisted of thirteen items, including: grains, roots, fish, meat, eggs, milk, vegetables, nuts, fruits, oils, fats, beverage ingredients, spices,

processed food and beverages, tobacco, and betel. All consumption expenditures are stated in monetary units (rupiah). Expenditures for the consumption of basic necessities that are not included in the food category are stated as "other expenses".

Micro household data in Bali was acquired from the published data from the Indonesia Family Life Survey (IFLS) of the Province of Bali in 2014. The data tracking results show that around 500 households in Bali were surveyed, producing a fairly complete dataset. The IFLS publications are panel structure data. However, in order to be in line with other datasets, this study only used one recent IFLS survey. Some of the data available in the IFLS included data on the consumption of various foods, non-food items, and other household expenses. In addition, data was available on the characteristics of individuals, households, and villages, such as the availability of village facilities.

3.2. Model Estimation

The analytical model used in this study was derived from the Engel function, as seen in Equation 5. For the purpose of this analysis, the model used in this study was reformulated as follows:

$$c_i = \alpha + \beta_1 inc_i + \gamma_i \sum hh_i + \beta_2 pov_i + \delta_i + \varepsilon \quad (6)$$

In this case, c represents consumption, inc represents income, hh represents the character of the household, pov represents an indicator of poverty, and δ represents other factors that determine consumption, whether they are observable or not. The regression coefficient estimation technique used in this study was the principle of the ordinary least squares (OLS) (Bilginol, Denli, & Şeker, 2015). Several other studies have used a more or less the same analysis model with certain modifications (Massaid, Hanif, Febrianti, & Chamidah, 2019).

The use of the OLS estimation technique in Equation 6 is often questioned because it does not anticipate the endogenous problems and their potential disturbance. As an alternative, this study used a fixed effect analysis technique by forming all the variables in the Equation 6 into a de-mean form, as follows:

$$\ddot{c}_i = \alpha + \beta_1 \ddot{inc}_i + \gamma_i \sum \ddot{hh}_i + \beta_2 \ddot{pov}_i + \varepsilon \quad (7)$$

In this case,

$$\ddot{c}_i = (c_i - \bar{c}) \quad (8)$$

and the same applies to all independent and dependent variables. Equation 7 is the regression model for the household's fixed area, and Equation 8 is the de-mean form of the consumption variables. Using this approach, the fixed elements of the fixed effect units will be lost. As an alternative, this study used a random effect approach.

4. RESULT AND DISCUSSION

4.1. Description of East Java Province

The East Java Province is located at 111˚0 'to 114˚4' east longitude and 7˚12 'to 8˚48' south latitude. The area of the East Java Province reaches 46,428 square kilometers, which is divided into four regional coordinating bodies, 29 districts, 9 cities and 658 sub-districts that contain 8,457 villages/wards (2,400 sub-districts and 6,097 villages). In general, the East Java region is divided into two main areas—mainland East Java, which covers almost 90% of the total area of the East Java Province, reaching 47,157.72 square kilometers, and the Madura Islands region, which covers approximately 10% of the total area. In the north, the East Java Province borders the Java Sea; to the east, it is bordered by the Bali Strait; to the south, it is bordered by open water, the Indonesian Ocean; in the west, it is bordered by the Province of Central Java.

Based on data from the Central Statistics Agency in East Java Province, the population in East Java in 2014 was projected to be 38,610,202 people. In 2013, the population of the East Java Province was recorded at 38,363,195 people, with a density of 795 people per square kilometer. The population density in cities is generally higher than in districts. Surabaya City has the highest population density of 8,551, and the largest population of 2,827,464, followed by Malang Regency with a population of 2,527,087 people, and Jember Regency at 2,394,608 people.

The value of income per capita depicts the economy of a population based on the total output value of an area, divided by the number of residents living in that area. This calculation will provide the value of an area's income per capita. The development of East Java Province's income per capita is presented in Figure 2.

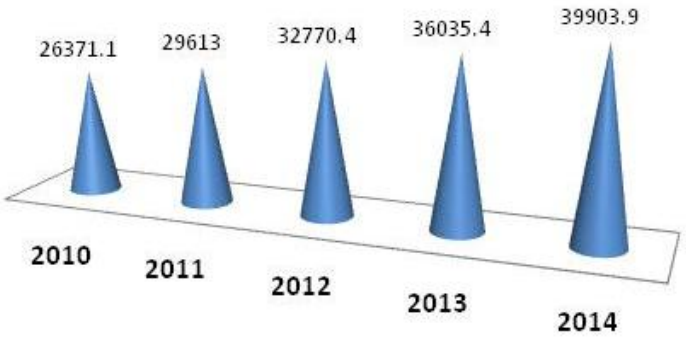

Figure 2. Income per capita in the East Java Province, 2010–2014
Source: Central Bureau of Statistics, 2019.

4.2. Description of Bali Province

Bali is one of the islands in the Nusa Tenggara Islands in Indonesia, and its capital city is Denpasar. In addition to Bali Island, the province of Bali consists of other smaller islands, including Nusa Penida Island, Nusa Lembongan Island, Nusa Ceningan Island, Serangan Island, and Menjangan Island. Geographically, Bali is located between Java Island and Lombok Island; it is about 3.2km from Java Island. Most Balinese people are Hindu. Bali Island is part of the Lesser Sunda Islands, and it is 153km long and 112km wide. Bali is located at 8°25'23' south latitude and 115°14'55' east longitude, which means that it is tropical like other parts of Indonesia. Mount Agung is the highest point in Bali, at 3,148 meters high. This volcano last erupted in March 1963. Mount Batur is another mountain in Bali. About 30,000 years ago, Mount Batur erupted and caused a terrible disaster. In contrast to the northern part, the southern part of Bali is lowland, and it consists of many flowing rivers.

The population of Bali is approximately 4,236,983 people (2019), with a majority of 86.91% adhering to Hinduism. Other religions followed in Bali are Islam (10.05%), Protestant Christianity (1.56%), Catholicism (0.79%), Buddhism (0.68%), Confucianism (0.01%), and Faith (less than 0.01%). In addition to the tourism sector, Balinese people also earn an income though agriculture and fisheries, predominantly using the Subak system. Some Balinese people choose to be artists. The languages spoken in Bali are Indonesian, Balinese and English, especially for those who work in the tourism sector. Three decades ago, the Balinese economy was largely reliant on agriculture, both in terms of output and employment. The tourism industry currently provides Bali's biggest revenue stream. As a result, Bali has become one of the richest regions in Indonesia. In 2003, around 80% of Bali's economy was dependent on the tourism industry. This substantial dependence on the tourism sector has caused the economy of the Province of Bali to decline as a result of the COVID-19 outbreak in 2020.

4.3. Macro Data Estimation Results

As previously mentioned, this study will estimate the consumption patterns of certain staples in East Java households. Thirteen groups of staples were tested, including: grains, roots, fish, meat, eggs, milk, vegetables, nuts, fruits, oils, fats, beverage ingredients, spices, processed food and beverages, tobacco, and betel. The consumption

pattern is explained using the coefficient income in the regression model in Equation 6. The two consumption patterns are shown in Figure 3. The first pattern (top panel) is a consumption pattern for food and beverages, and the bottom pattern shows a consumption pattern for grain consumption. The vertical axis of the image is the natural logarithm for consumption, and the horizontal axis of the graphic shows the natural logarithm for income.

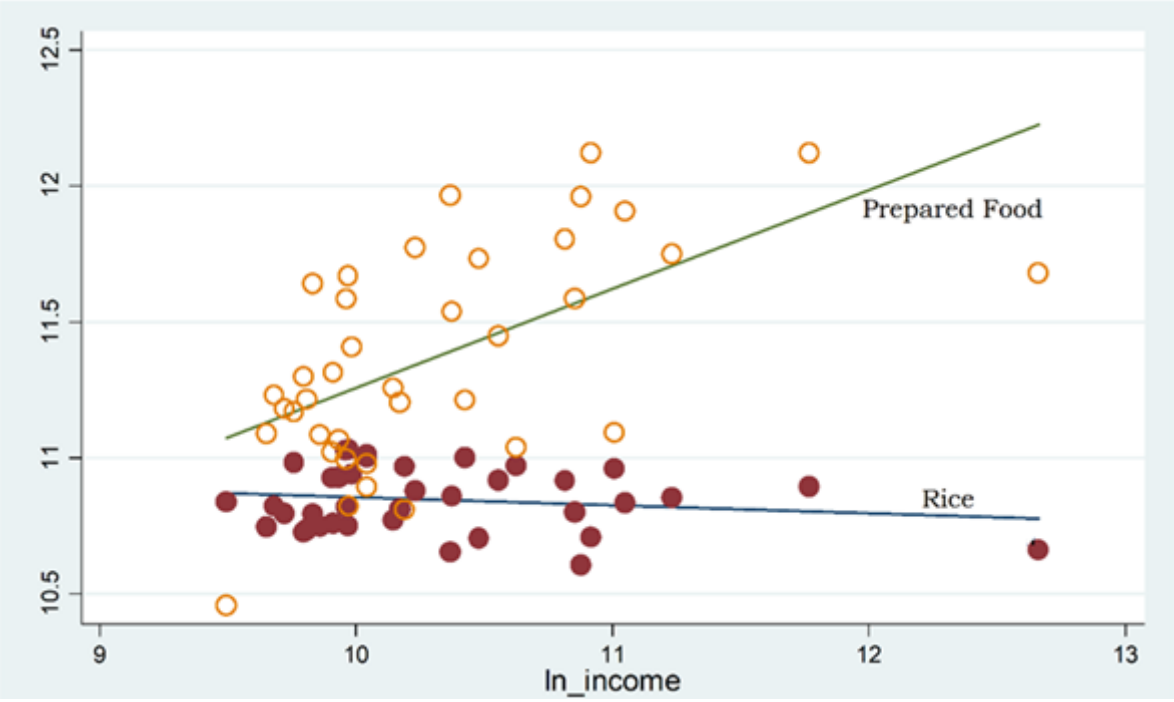

Figure 3. Consumption of prepared food and rice.

Source: Stata Output.

The two consumption patterns above represent the household consumption behavior for two types of goods with different properties. For the consumption of staple foods (grains), it can be seen that income variations do not cause striking variations in consumption. In other words, an increase in household income does not significantly affect grain consumption. Conversely, in terms of the consumption of food and beverages, the correlation with income is relatively high; in other words, the higher the level of income, the higher the consumption of food. This visualization shows that income elasticity is largely determined by the type of goods being consumed. The income elasticity of overall foodstuffs can be viewed numerically in Table 1.

These results show that food consumption expenditure is relatively inelastic. Numerically, the results show that an increase in income is not followed by a proportional increase in consumption. In the fourteen cases studied, only seven cases demonstrated a significant income elasticity, and the rest were not statistically significant. Instances of consumption expenditure with significant income elasticities included the consumption of fish, meat, eggs, milk, fruit, seasoning, and prepared foods. However, the consumption of grains, roots, vegetables, beans, oils, fats, drinks, tobacco, and betel did not demonstrate a significant income elasticity.

This research reinforces the theory that food consumption has a relatively low-income elasticity. This study divides the types of foodstuffs into two classes. First, staple foods are defined as being good sources of carbohydrates, such as whole grains and root vegetables. For this food category, the income elasticity is almost non-existent. That is, an increase in income does not in any way increase the demand for such basic staples. Second, complementary staples, such as fish, meat, seasoning, eggs, and milk have a significantly positive elasticity, even albeit on a relatively small scale. An increased income has the potential to increase consumption expenditure for side dishes, such as eggs and milk, with only a relatively small percentage increase.

Table 1. Income elasticity of various consumptions

Type	Elasticity	Standard Error
Grains	0,028	0,023
Bulbs	0,014	0,106
Fish	0,375*	0,125
Meat	0,315*	0,090
Eggs & Milk	0,130*	0,060
Vegetables	0,000	0,042
Nuts	0,014	0,054
Fruits	0,160*	0,053
Oils & Fats	0,003	0,036
Drinks	0,009	0,035
Seasoning	0,162*	0,058
Prepared Food	0,167*	0,071
Tobacco & Betel	0,105	0,060
Others	0,089*	0,047

Note: *) significant in 5% level.

This paper also examines the factors that influence household consumption in various situations. Based on previous findings, consumption groups can be divided into two broad categories: Staple carbohydrate foods and protein foods, which includes side dishes. The estimated results of the consumption model in the case of fish, meat, eggs and milk has been presented in Table 2. The calculation results show that the household's level of education has a positive and significant influence on the consumption of meat, eggs, and milk. Areas with households that have higher education levels consume relatively more meat, eggs, and milk. On the other hand, poverty indicators are not correlated with the consumption of one's envisioned needs. The empirical evidence shows that poor households still need to consume side dishes such as fish, meat, eggs, and milk.

Table 2. Determinants of side dish consumption

	(1)	(2)	(3)
Variables	**Fish**	**Meat**	**Eggs**
Income	0.376**	0.315***	0.130*
	(0.179)	(0.114)	(0.0640)
Poverty	0.0220	-0.00127	-0.0110
	(0.0183)	(0.0167)	(0.0120)
Education	0.0121	0.0382**	0.0266**
	(0.0217)	(0.0157)	(0.0128)
Health	-0.0725**	-0.00884	0.0242
	(0.0341)	(0.0272)	(0.0189)
Constant	9.513***	3.248**	4.615***
	(2.254)	(1.515)	(0.942)
Observations	38	38	38
R-squared	0.338	0.649	0.762

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

The main regression coefficient that can be interpreted is that a one percent increase in income will cause an increase in fish consumption by 0.37%. Using the same logic, it can be said that an increase in income by one percent, on average, will increase meat consumption by 0.315%. This finding indicates that there is a similarity between the effects of income on fish and meat consumption. However, the income elasticity for egg and milk consumption is relatively low in comparison; the elasticity value is 0.13, which means an increase in income by one percent will increase the consumption of eggs and milk by only 0.13%.

Table 3. Determinants of fruits and seasoning

Variables	(1) Fruit	(2) Seasoning	(3) Prepared Foods
Income	0.160***	0.163*	0.167*
	(0.0545)	(0.0920)	(0.0908)
Poverty	-0.0215**	0.00249	-0.0159
	(0.00994)	(0.0104)	(0.0109)
Education	0.0156	0.00405	0.0203
	(0.00980)	(0.00891)	(0.0148)
Health	0.0131	-0.0263**	0.0209
	(0.0142)	(0.0125)	(0.0237)
Constant	5.906***	8.578***	6.577***
	(1.041)	(1.338)	(1.339)
Observations	38	38	38
R-squared	0.767	0.267	0.684

Note: Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

The low-income elasticity of consumer goods can also be found in the case of the consumption of fruits, herbs, and prepared foods. The results, which include several other explanatory variables, can be seen in Table 3. Calculations have shown that income elasticity for the consumption of fruit, herbs and prepared foods is relatively low, at around 0.16% in all three cases; an increase in income of one percent will increase the consumption of fruit, herbs, and processed foods by an average of 0.16%. Interesting findings related to the determinants of consumption included the facts that poorer households consume less fruit and households with higher levels of health had lower levels of herb consumption. Apart from income levels, there is no other significant determinant of the consumption of processed food.

Empirically, relatively few independent variables had an individual effect (t test) on the dependent variable, which can be explained by several factors. One reason is the relatively high collinearity between independent variables. Testing the assumption of a strong collinearity among independent variables can be done by measuring the coefficient of the variance inflation factor (VIF) and tolerance, which has been summarized in Table 4.

Table 4. VIF and tolerances

Variabel	VIF	Tolerance
Education	6,12	0,163
Poverty	3,49	0,286
Health	2,78	0,360
Income	1,40	0,716

The results of the investigation show that the VIF values for the independent variables are all below the value of 10. The highest VIF value is for the education variable, and the main independent variable (income) has the lowest VIF value. This result shows that the collinearity between independent variables is not a problem in terms of the model's estimation.

Another problem commonly encountered in cross-regional regression analyses is the potential for heteroscedasticity. This paper has not examined this problem individually; instead, it corrected the model directly using the robust standard error approach, as suggested by White. By controlling the potential violations of the regression assumptions, the results and their interpretation can be scientifically justified.

Based on findings in the study, many important factors can be concluded. First, in general, the income elasticity of food consumption expenditure is relatively elastic. Second, in the case of the consumption of carbohydrate-based staples such as grains and roots, income elasticity is not significant. That is, an increase in income does not cause a significant increase in the consumption of these goods. Third, the consumption of protein-based foods such as fish,

meat, eggs, and milk has a relatively significant income elasticity. These findings indicate that household consumption patterns are determined by the type of food. Furthermore, several explanatory variables, such as education and poverty levels, have been proven to impact the level of consumption of certain food items. Such findings present several important implications. An increase in income is not accompanied by a proportional increase in consumption. In the long-term, the agricultural sector, which produces the majority of food staples, grows relatively slowly in comparison to other sectors. Several steps can be carried out in order to overcome the relatively low demand for basic commodities. One method is to package staple foods into processed food products that have a higher economic value. The results of research studies consistently show that processed food products have a higher income elasticity than staple foods.

4.4. Micro Data Estimation Results

The previous section presented an estimation model for Engel's function using aggregate data for 38 districts and cities in East Java, Indonesia. However, in terms of micro data, household data from the Bali Province were used. A survey was conducted in around 500 households, which asked several questions regarding the level of consumption for various needs, household expenses, education level, the age of the head of the household, the status of the head of the household, the number of household members, the work status of the head of the household, and the status of household welfare. The data collected was published in the Indonesia Family Life Survey in 2014.

Bali Province is an area with relatively low poverty levels. Official data shows that, in 2014, the poverty rate of Bali Province reached only 4%. Based on household poverty data acquired from the survey, household poverty levels were 3.94%. Thus, the figures from the survey were very similar to official poverty data from the government, meaning that data from the survey are relatively representative of welfare in the Bali Province. From a total sample of 533 households, 21 households were identified as poor.

With regard to government programs, one of the most popular forms of anti-poverty programs is the provision of cash. Cash transfer programs are not only given to households that are classified as 'poor'; some households above the poverty line still receive assistance. In Bali, around 17.8% of households receive cash assistance. Even though only 4% of households are poor by definition, there are quite a lot of households that are vulnerable to being poor. Therefore, this study does not use data on poor households in absolute terms; instead, it uses data from households receiving government assistance.

Household consumption patterns are generally divided into two categories: Poor households and non-poor households. The measurement of consumption patterns initially charts the percentages of the consumption of various foodstuffs in the two types of households.

Table 5. Household expenditure (%)

No.	Item	Poor Households		Non-Poor Households
		Absolute Poor Household	Program Recipients	
1	Food	63,12	62,53	51,02
2	Non-Food	36,87	37,46	48,97
3	Rice	20,49	18,27	11,07
4	Staple	23,52	20,87	12,13
5	Vegetables	6,58	6,69	5,09
6	Oil	3,72	2,95	2,15
7	Medical	1,71	1,79	2,04
8	Clothing	1,27	1,43	1,85
9	Dairy	1,45	1,97	3,11
10	Education	4,72	4,48	7,09
11	Housing	10,31	11,29	12,49
12	Meat and Fish	6,62	7,01	6,98
13	Alcohol and Tobacco	3,72	6,40	4,68

In this study, around thirteen types of household expenditure were studied, including expenses for buying rice, staple foodstuffs, vegetables, general food, oil, medicine, clothes, milk, education, house repairs, meat and fish, alcohol and cigarettes, and other expenses. In general, the largest percentage of monthly household expenditure in poor households goes towards food purchases. On the other hand, in non-poor households, the largest portion of household expenditure goes towards items other than food. The results of the calculation can be seen in more detail in Table 5.

Table 5 shows the average household expenditure data for three types of household: Poor households in absolute terms, poor households receiving government programs, and non-poor households. The results of the calculations show that poor households allocate more expenses to foodstuffs (63.12%), whereas households that receive government assistance programs allocate 62.53% of their expenditures to foodstuffs. Non-poor households, on the other hand, allocate 51.02% to food expenditure. In contrast, non-food expenditures display an inverse pattern. Poor households allocate 36.87% of their expenditure to non-food items, households receiving government programs allocate 37.46%, and non-poor households allocate 48.97%.

The pattern of household expenditure and economic capacity has the tendency to increase or decrease regularly. Expenditures for food are relatively larger, whereas non-food expenses are relatively small. For example, in terms of health, the general household expenditure is only 2%. In further detail, poor households allocated 1.71% to health expenditures, and households receiving government programs allocated 1.79%, whereas non-poor households allocated 2.04%.

Although there is a general systematic pattern between consumption expenditure and household economic status, several interesting findings were uncovered. First, the expenditure of households receiving government assistance was greater in three categories of expenditure: vegetables, meat and fish, and alcohol and tobacco. If government assistance could generate greater spending on vegetables as well as meat and fish, this would certainly be very useful in terms of improving the health of the household. However, if the expenditure on alcoholic beverages and tobacco also increases, this would be a concern for the government. Second, households that receive government assistance allocated the least amount of money to the education category. This is noteworthy because government assistance should be used for positive welfare costs, including health and education. However, it appears that, instead, the allocation for alcohol and tobacco was relatively high, and the allocation for education was relatively low.

Table 6. Coefficients of income consumption

No.	Item	Split Sample		Full Sample
		Program Recipient	Non-Recipient	
1	Rice	0,051	0,030	0,031
2	Staple	0,058	0,033	0,035
3	Vegetables	0,015+	0,027	0,025
4	Dried	0,019	0,016	0,016
5	Meat	0,020	0,031	0,030
6	Fish	0,011+	0,013	0,014
7	Dairy	0,022	0,026	0,026
8	Spices	0,009+	0,011	0,113
9	Sugar	0,005	0,004	0,004
10	Oil	0,008	0,009	0,009
11	Beverages	0,011	0,021	0,020
12	Alcohol & Tobacco	0,023+	0,029	0,028
13	Snack	0,018	0,031	0,029
14	Food-out	0,002+	0,031	0,028
15	Food	0,227	0,288	0,280
16	Non-Food	0,067	0,252	0,232

Note: +) non-significant in conventional level.

Furthermore, in order to determine the impact of income on consumption expenditure, the Engel model regression test was performed simultaneously. The results of the income coefficient test on consumption can be seen in Table 6.

Table 6 shows the income-consumption coefficient that presents the changes in consumption due to changes in income. Column one and column two show the estimation results using a split sample of recipient households and non-recipient households. As a comparison, an estimation was calculated using the full sample in column three. The results of the study show that the reaction of household consumption to changes in income is comparatively similar for food and non-food items. However, a difference occurs in the behavior of households that receive anti-poverty assistance, as program recipient households tend to spend more on foodstuffs. This result is not surprising because poor households are inclined to buy more food when they experience an increase in income.

The results also showed that several coefficients were not significant, such as the consumption of vegetables, fish, spices, alcohol, cigarettes, and food outside the home; in other words, the household's expenditure on vegetables, fish and seasoning does not change significantly when their income is increased. In the context of improving household welfare, this study may become a reference for anti-poverty programs in the future. In addition, the results show that cigarette and tobacco consumption did not increase as a result of anti-poverty programs. This confirms previous findings as, although expenditure on alcohol and tobacco is relatively high, households receiving government assistance did not increase their consumption of such goods after experiencing an increase in income.

5. CONCLUSION

The results of this study's research into consumption patterns and household poverty has determined several important points. First, it was found that the consumption of foodstuffs due to an increase in income is relatively inelastic. Only a few cases showed a significant elasticity, such as the consumption of meat, fish, fruit, seasoning and processed foods. At the macro level, poverty does not significantly influence consumption patterns; however, at a household micro data level, income levels have a significant effect on all types of household consumption, including food and non-food items.

Differences in consumption patterns appeared when the sample was sorted according to welfare status: poor households, households receiving government assistance, and households that are not beneficiaries (not poor). Households that receive government assistance have specific spending patterns, as they use more of their additional income on food requirements. However, for foodstuffs such as vegetables, fish and spices, the effect of their additional income is not significant. Furthermore, beneficiary households have a relatively high expenditure on alcohol and tobacco; however, income differences do not lead to an increase in consumption of these unhealthy goods. The results of this study indicate that the government needs to pay attention to the allocation of expenditure in poor households, in order to improve welfare. Shopping for items that provide health and nutritional support should be better in households that receive assistance. Furthermore, education and health costs, which are still low, must remain the responsibility of the government.

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