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The pattern of poor household food consumption: The case of West Java Province

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ABSTRACT: The result of a LA-AIDS showed that the food consumption of poor households in West Java is influenced by its own-price, the price of other commodities, income, number of household members, household location, education of the head of household, and work type of the head of the household. The own-price elasticity identified that the price increase in each commodity group does not affect the consumption of the general food group. The cross-price elasticity of food groups showed more complementary.

El patrón de consumo de alimentos deficiente en los hogares: el caso de la provincia de Java Occidental

RESUMEN: El resultado de una LA-AIDS mostró que el consumo de alimentos de los hogares pobres en Java Occidental está influenciado por su propio precio, el precio de otros productos básicos, los ingresos, el número de miembros del hogar, la ubicación del hogar, la educación del jefe de hogar y tipo de trabajo del jefe de hogar. La elasticidad del precio propio identificó que el aumento de precios en cada grupo de productos básicos no afecta el consumo del grupo de alimentos en general. Mientras tanto, la elasticidad precio cruzado de los grupos de alimentos se mostró más complementaria.

KEYWORDS / *PALABRAS CLAVE*: Food consumption expenditures, poor households, LA-AIDS, elasticity, West Java / gastos de consumo de alimentos, hogares pobres, LA-AIDS, elasticidad, Java occidental.

JEL classification / *Clasificación JEL*: D12, Q11, Q18.

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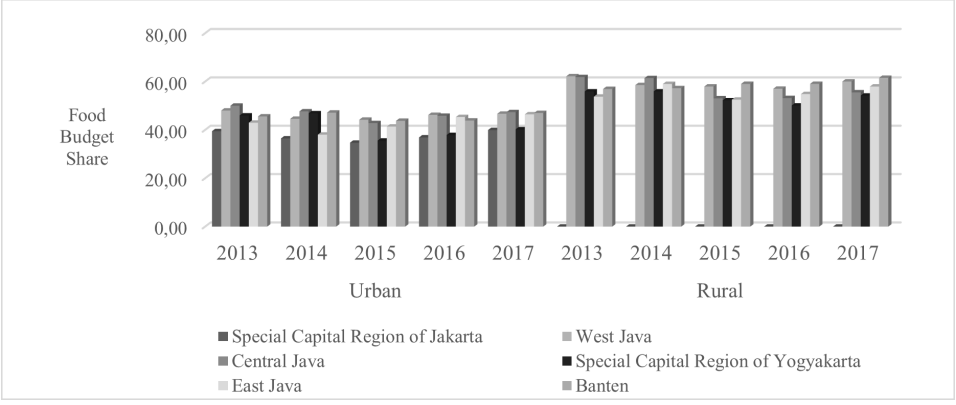
1. Introduction

Food availability is one of the government's most prominent issues, with the increasing population causing high food demand. In addition, the large share of food expenditure in household expenditure and fluctuating food prices decrease the population's purchasing power, especially the poor (Faharuddin & Yunita, 2015). One indicator of household welfare is income and expenditure, while a shift in expenditure can indicate changes in welfare. Household expenditure can determine the quality of life, as total food expenditure can be a parameter of household welfare. Thus, the higher the welfare, the smaller the share of food expenditure (Deaton & Muellbauer, 1980).

Food expenditure can indicate the degree of food security; the higher the food expenditure, the smaller the food security. In other words, households with low expenditure tend to have low food security or food vulnerability. Therefore, food expenditure share closely relates to food security, such as consumption, food diversity, and income. In 2017, the food expenditure share in Java Island placed DKI Jakarta with the lowest food expenditure share with 39.94 percent, and the highest being West Java with 51.01 percent (BPS, 2017). This data indicated that West Java Province used most of their expenditure for food, thus having lower food security. This shows that households in West Java lag behind DKI Jakarta regarding food security, despite being geographically close. Figure 1 shows that from 2013 to 2017, West Java Province had a high share of food expenditure, especially in rural areas, indicating rural areas' higher food vulnerability than urban areas in West Java Province.

FIGURE 1

Rural and Urban Food Expenditure Share by Provinces in Java Island 2013-2017



Source: BPS (2017).

West Java is the province with the largest population in Indonesia. In 2017, the population reached 48,037,827 people with a population growth rate of 1.39 percent, and the number of poor people reached 4,168,440 people or 8.71 percent of the total population (BPS, 2017). The large population and high poverty rates increased the vulnerability of food insecurity. Household food expenditures can be an indicator of poverty. Poor households generally have low income, causing low purchasing power, thus forcing them to select their spending and even negating specific basic needs to meet particular needs (Sengul & Tuncer, 2005). Meanwhile, the poverty line in West Java Province continued to increase from 2013 to 2017 but was still below the national poverty line of IDR. 374,478, - this indicates that many of the population of West Java province still live below the poverty line (BPS, 2017).

Table 1 shows the monthly per capita expenditure in West Java Province based on household location. Households in urban areas in 2016 and 2017 spent more on non-food than food. However, in 2017, food expenditure in urban areas increased slightly compared to 2016, from 46.20 percent to 48.68 percent. Meanwhile, food expenditure in rural areas still dominates household expenditure. Food expenditure for rural households in 2016 and 2017 increased from 57.02 percent to 60.02 percent of total expenditure. This discrepancy of non-food expenditure in urban areas compared to rural areas shows that the welfare in urban areas is higher than in rural areas.

TABLE 1

Percentage of Average Per Capita Expenditure per Month

West Java Province by Region Type 2016-2017

Region	Food Consumption		Non Food Consumption	
	2016	2017	2016	2017
Urban	46.20	48.68	53.80	51.32
Rural	57.02	60.02	42.98	39.98
Total	48.56	51.01	51.44	48.99

Source: BPS (2017).

Food consumption patterns of poor households have been crucial for economists and policy-makers in developing countries as they involved various empirical results. Vu (2020) showed that food consumption patterns in Vietnam are affected by income and prices, as expected, and socioeconomic and geographic factors. All food items have positive expenditure elasticities and negative own-price elasticities. Burger et al. (2017) found substantial variation in the price and income elasticities across the income distribution. The bottom quartile is extremely sensitive to food and clothing price increases, and the top quartile is as sensitive as households in developed countries. Fujii (2013) suggested that the pattern of food consumption among poor households was different because socioeconomic conditions and household location influenced it. Le (2008) showed that rice was a major commodity for poor households in Vietnam, as indicated by the high expenditure share of rice in poor households, with portions decreasing as household income level increases. Akinbode (2015) in South-

West Nigeria showed that expenditure elasticities of gaari and palm oil were inferior food items while others could be classified as normal. Own-price elasticities showed that beans, plantain, yam flour, and rice were luxuries while others were necessities. Cross-price elasticities revealed that some were substitutes while others were compliments and some were not related. Dubihlela & Sekhampu (2014) showed that price changes in South Africa would be responded to by poor households, characterized by the negative price elasticity, with only bread marked as positive. This condition contradicts the law of demand, where consumption rises when prices rise, making these commodities Giffen goods.

The studies above show different consumption patterns in various countries and the effect of prices and income. Poor household consumption based on the work type of household head, namely agriculture and non-agriculture, is significant in Indonesia, particularly in West Java Province, where the majority work in the agricultural sector. Previous studies on food consumption focus nationally, while this research is at the regional or provincial level. Thus, the objectives in this study are: (1) to determine the effect of price and income and socio-demographic factors on food consumption in poor households in both urban and rural areas in West Java Province; (2) analyze the response to changes in food demand in poor households in West Java Province from food prices and income.

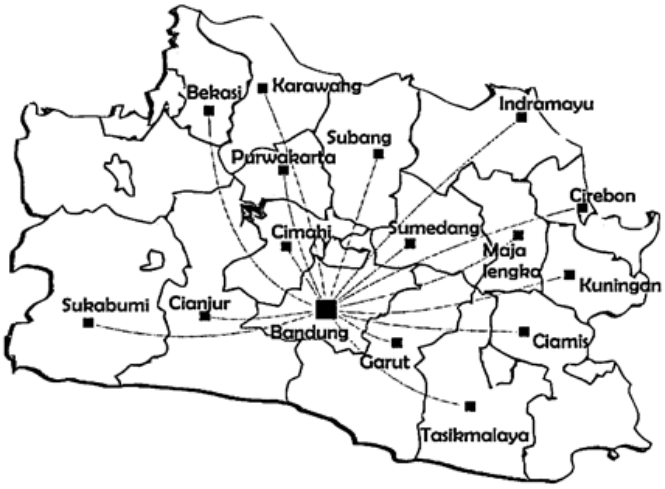
The remaining part of this study is organized as follows. The second section describes the method and data collection of households in West Java in the National Socio-Economic Survey (Susenas). The third section presents the results and discussion. The last section discusses our conclusions and policy implications.

2. Method

This research used cross-section data from the 2017 National Socio-Economic Survey (Susenas) of the Central Bureau of Statistics (Badan Pusat Statistik or BPS) with a sample of poor households based on rural and urban poverty lines in West Java Province. It was calculated that 1,691 out of the 23,756 Susenas household samples in West Java Province were poor.

FIGURE 2

Foodscape Map in West Java Province



Source: Turgarini (2020).

Bandung, the capital of West Java, is a large foodscape with local, regional, and international food sources. Many raw materials were brought from West Java, Central Java, and East Java. Additionally, Sumatra, Kalimantan, Sulawesi, and China contributed to its food supply. West Java regions such as Sukabumi, Cianjur, Garut, Tasikmalaya, Ciamis, Kuningan, Majalengka, Cirebon, Sumedang, Indramayu, Subang, Purwakarta, Karawang, Bekasi, and others supplied Bandung's food including vegetables, fruits, proteins, herbs, and carbohydrates. North Sumatra and West Sumatra supplied protein, carbohydrates, and fruits. Jambi, Lampung, and Palembang supplied fruits, and Central and East Java supplied spices, fruits, carbohydrates, and protein. From abroad, many raw materials were imported from China, especially garlic (see Figure 2).

The method used in this study is a Linear Approximated Almost Ideal Demand System (LA/AIDS). A Linear Approximated Almost Ideal Demand System (LA/AIDS) is a development of the Engel curve and an uncompensated demand function derived from utility maximization theory. Deaton & Muellbauer (1980) stated a relationship between income (expenditure) and the level of consumption resulting in the expenditure share as follows:

$$w_i = \sum_{j \neq i}^{n} \alpha_j \log p_j + \sum_{j \neq i}^{n} \gamma_{ij} \log p_j + \beta_i \log \left(\frac{y}{I}\right) \quad [1]$$

where w_j shows the expenditure share for the i commodity, while y is the explanatory variable, namely income (expenditure). The AIDS demand model is based on a particular cost function representing the structure of individual preferences. The LA-AIDS model equation built by Deaton & Muellbauer (1980) is as follows:

$$w_i = \sum_{j \neq 1}^{n} \alpha_j \log p_j + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log y - \beta_i \sum_{i=1}^{n} w_i \log p_i \quad [2]$$

Some assumptions of the demand function are applied in the AIDS demand model, namely:

1. Adding up, which allows the expenditure proportion to be 1 or written as:

$$\sum_{i=1}^{n} \alpha_i = 1, \sum_{i=1}^{n} \gamma_{ij} = 0, \sum_{i=1}^{n} \beta_i = 0 \quad [3]$$

2. Homogeneity. If there is a proportional change in all prices and expenditures, it does not affect the number of purchased items which can be written as follows:

$$\sum_{j=1}^{n} \gamma_{ij} = 0 \quad [4]$$

3. Symmetry. Identifies the consistency of consumer choices written as follows:

$$\gamma_{ij} = \gamma_{ji} \quad [5]$$

This research modifies previous research (Sengul & Tuncer, 2005) but distinguishes itself by adding several socio-demographic characteristics. It also includes instrumental variable and Inverse Mills Ratio (IMR) to overcome endogeneity problems and zero expenditure. The IMR variable was added to account for households that did not consume certain commodity groups. IMR is obtained by two-step estimation from the Heckman test (Bushway *et al.,* 2007; Taljaard *et al.,* 2004; Singh *et al.,* 2011). Meanwhile, the instrumental variable used the total household income proxy with the total expenditure of poor households. Thus, the specifications of this research model are as follows:

$$w_i = \alpha_i + \sum_j \gamma_{ij} \ln p_j + \beta_i \ln\left(\frac{y}{I}\right) + \mu_i \text{jart} + \tau_i \text{d\_lok} + \rho_i \text{d}_{\text{agr}} + \theta_i \text{rls} + \delta_i \text{IMR} + \varepsilon_i \quad [6]$$

where *wi* is the proportion of household expenditure for the *i* commodity group, lnp_j is the natural logarithm of the commodity group price of *j*, ln *(y/I)* shows the natural logarithm of total food expenditure deflated by the Stone price index, *I* is the Stone price index, i.e., $Log\ p^* = \sum_{i=1}^{14} w_i \text{Log} p_i$, *jart* is the number of household members, *d_lok* shows the dummy area (rural = 1, other = 0), rls shows the years of schooling, *d_agr* shows the work dummy of the household head (working in the agricultural sector = 1, other = 0), ε_j is an error term.

The income variable in this study was approached with the value of total household food expenditure. The price variable uses the unit value from dividing the commodity price by the quantity purchased. The unit value will provide biased results caused by measurement errors, quality effects, and household expenditure on demand patterns. Cox & Wohlgenant (1986) explained that using cross-section data in estimating demand systems causes price variations which might be unsuitable in estimating price elasticity. Unit values will be corrected by the price differential method, modified by the Cox & Wohlgenant (1986) methods. The unit value is corrected by adding the district/city middle value and the estimated residual regression difference in the mean value of each district/city with socio-demographic factors, while the price is obtained from the middle unit value per district/city per corrected commodity group. Households in the same district/city can be assumed to face the same price per commodity from this method. The first step is to conduct the regression of the difference in unit values with the socio-demographic variables as follows:

$$v_i - v_{median} = \alpha_i + \mu_i \text{jart} + \tau_i \text{d\_lok} + \rho_i \text{d\_agr} + \theta_i \text{rls} + \varepsilon_i \quad [7]$$

the second step is to add the center value of the district/city unit value with the residual center value of the city/district.

$$p_i = v_{median} + \varepsilon_{i(median)} \quad [8]$$

where p_i is the corrected price, v_i is the unit value per household, and v_{median} is the middle value of commodity unit value per district/city. Changes in household food consumption from prices and income are explained using the elasticity value from the coefficient of the LA-AIDS model. This analysis uses price and income elasticity calculated by the LA-AIDS estimation parameters formula from Deaton & Muellbauer (1980), as follows:

$$\text{Price Elasticity: } \varepsilon_{ii} = \frac{\gamma_{ii} - \beta_i w_i}{w_i} \quad [9]$$

$$\text{Cross Elasticity : } \varepsilon_{ij} = \frac{\gamma_{ij} - \beta_i w_j}{w_i} \text{ ; i≠j,} \quad [10]$$

$$\text{Income Elasticity : } \eta_i = 1 + \frac{\beta_i}{w_i} \quad [11]$$

3. Results and Discussion

Table 2 shows that the average monthly expenditure for all poor households in West Java Province is IDR.1,213,907, ranging from IDR.171,588 to IDR.4,370,556 - a significant difference between the minimum and maximum expenditure. Most of the expenditure is for food with IDR.847,685, and the remaining is non-food with IDR.366,222, indicating that food dominates the expenditure. When faced with limited income, food will be prioritized and be the primary expenditure of the household.

The overall food expenditure share is higher than the non-food expenditure share. Food expenditure share reached 69.83 percent, while non-food reached 30.17 percent, concluding that poor households in West Java Province are vulnerable to food security. This result is similar when based on household location and the household head work type; food expenditure is greater than non-food. Thus, based on household location or type of work of the head of household, food security is classified as vulnerable because of its > 60 percentage.

TABLE 2

Statistics of Total Expenditure (Food and Non-Food)

Based on Location and Type of Work of HoH (in Rupiah)

Household Classification	Total Food Expenditure		Total Non-Food Expenditures			Total Household Expenditure		
	Average	Standard Deviation	Average	Standard Deviation	Expenditure Share (%)	Average	Standard Deviation	Expenditure Share (%)
Total	1,213,907	547,201	847,685	414,573	69.83	366,222	192,385	30.17
Rural	1,116,082	512,068	784,024	389,252	70.25	332,058	172,541	29.75
Urban	1,301,117	562,833	904,438	428,211	69.51	396,679	203,809	30.49
Agricultural	1,150,482	496,045	819,262	388,315	71.21	331,220	161,959	28.79
Non Agricultural	1,246,844	569,397	862,445	426,997	69.17	384,399	204,137	30.83

Source: BPS (2017), own calculations.

Selectivity bias must be addressed to ensure non-biased estimation of the request function. Moeis (2003) and Park *et al.* (1996) stated that selectivity bias occurred as some households do not consume a food commodity due to dietary patterns and vegetarianism. Therefore, some households do not consume meat and have very short enumeration times. Hence, not including households withholding consumption of a specific commodity will produce a biased parameter estimate.

Anticipating this selection bias can be done by combining or grouping commodities or enlarging the analyzed commodity groups. This study aggregates commodities into eight groups: grains, tubers, animal-sourced foods, vegetables, fruits, beans, processed foods, and others. If there is an empty value, zero expenditure is overcome by adding each commodity or commodity group's Inverse Mills Ratio (IMR) as an inde-

pendent variable (Heien & Wessells, 1990). Adding the IMR variable help consider households withholding consumption of a commodity or commodity group.

The instrumental variable to overcome endogeneity for monthly household food expenditure is through the total household expenditure (total food consumption plus total non-food consumption). Household income is an instrumental variable for household expenditure; however, it should be correlated with the instructed variables and not correlated with errors in the central equation (Attanasio *et al.,* 2013; Sironi, 2019). Relevance showed that the total expenditure coefficient is significant at 1 percent, meaning the total expenditure variable correlates with total household food expenditure and can be an instrumental variable. The second requirement for total expenditure as an instrumental variable is for food to be exogenous.

Table 3 shows that most of the own-prices and prices of other commodities significantly influence the expenditure share of all food groups, except for fruit. This is in line with (Paul *et al.,* 2014), which stated that food prices significantly influence the food expenditure share for poor households in Ghana. Poorer households have lower levels of education, spend a larger share of their limited income on purchasing food, have smaller harvests, and often buy their staple foods despite high market prices compared with wealthier households. Meanwhile, of the 56 existing coefficients, 64.43 percent have significant values at 1-10 percent. Price variable causes positive and negative relationships in food expenditure. A positive relationship shows that a price increase will increase the food expenditure share and vice versa. Both occur because the share of food expenditure results from dividing the expenditure of commodity groups by total food expenditure. The value of commodity group expenditure is obtained from multiplying unit values (price proxy) and the amount consumed. Thus, if the price increase is greater than the consumption decrease, the expenditure share will increase; conversely, if the price increase is smaller than the consumption decrease, the shared expenditure will decrease.

TABLE 3

Estimated Household Food Expenditure of Poor Households in West Java Province in 2017

Variable	Grain	Animal-sourced Food	Vegetables	Beans	Fruit	Processed Food	Other Food
Grain Prices	0.111***	-0.062***	-0.050***	-0.015***	-0.001	0.030**	-0.011*
Tuber Prices	-0.019**	-0.044***	0.007*	0.009***	-0.003	0.032***	0.020***
Animal-sourced Food Prices	-0.028***	0.009**	-0.009***	-0.003*	-0.003*	0.040***	-0.005*
Vegetable Prices	-0.027***	-0.023***	0.011***	-0.001	-0.002	0.048***	-0.006***
Beans Prices	0.013	-0.032***	-0.002	0.028***	-0.001	0.022*	-0.023***
Fruit Prices	-0.010	0.023***	-0.002	0.008**	0.006	-0.013	-0.006
Processed Food Prices	-0.067***	-0.036***	-0.027***	-0.039***	-0.007*	0.168***	0.004
Other Food Prices	-0.002	-0.013	-0.024***	0.001	-0.001	0.018	0.014*
Household Income	-0.180***	-0.118***	-0.047***	-0.043***	-0.011***	0.403***	-0.001
Number of household members	0.023***	-0.008***	-0.005***	-0.003***	-0.002**	-0.002	-0.005***
Years of Schooling (years)	-0.003***	0.002***	0.000	0.000	0.000	0.002***	0.001*
Area (rural = 1)	0.013***	-0.017***	0.004*	-0.001	-0.001	-0.001	0.001
Household Head (Farmer = 1)	0.023***	-0.004	0.003	-0.003*	0.001	-0.022***	0.000
Instrumental Variable	0.084***	0.173***	0.060***	0.039***	0.014***	-0.373***	0.009

Variable	Grain	Animal-sourced Food	Vegetables	Beans	Fruit	Processed Food	Other Food
IMR	-0.002	0.025*	0.000	-0.020***	-0.011	0.013*	0.021**
Constant	0.119	-0.126	0.266***	-0.188***	0.000	0.636***	0.132
R-Square	0.518	0.266	0.198	0.229	0.023	0.708	0.059
Chi^2	1818,530	621,040	417,120	502,900	40,410	4094,480	117,130

Source: BPS (2017), own calculations.
***, **, * shows a significance level of 1 %, 5 %, and 10 %.

Grain's price shows a positive and significant value on the grain expenditure share, equal to 0.111. This increasing demand is because grain is the primary commodity for most poor households in West Java; thus, its price increase does not reduce the commodity expenditure share. To analyze the response to price changes, the own-price and price of other goods can be seen in demand elasticity in the next section. This was consistent with Rono *et al.* (2017), which found that the price of rice showed a positive and significant effect on the rice expenditure share in Kenya.

The household income proxied from total food expenditure deflated with the stone price index showed a significant effect at 1-10 percent in influencing the food expenditure share of poor households in West Java Province. Other food groups do not show a significant effect. This means that the food expenditure share in the other-food commodity groups is not affected by income. This is possible because the components in the other-food groups consist of spices, beverages, other consumption, cigarettes, and oil, so food consumption is not affected by income. Thus, income does not affect the consumption of the other-food commodity groups as one component in the other food group is cigarettes (betel tobacco). In 2017, the second-largest household expenditure was cigarettes, reaching 6.66 percent of total food expenditure. Cigarettes have become common in Indonesia and are often found in various places. Despite the government limiting smoking in public places and campaigning against cigarettes, it does not dramatically decrease its consumption (BPS, 2017).

The socio-demographic characteristics included in the LA-AIDS demand system are intended to capture poor households' preferences or consumption choices in West Java Province. Table 3 shows the LA-AIDS coefficient; not all socio-demographic variables affect the food expenditure share of poor households. Estimates show that of the 35 coefficients, around 48.57 percent effect at the1-10 percent. The results show that the number of household members significantly affects 1-10 percent of the total food commodities expenditure share, except for processed food. Estimation shows that the number of household members negatively affects all food commodities groups, except grain. A negative effect indicates that an increase in the number of family members will decrease the expenditure share of commodity groups. This was consistent with previous research, which stated that the number of household members would affect the level of consumption and household expenditure (Marchetti & Secondi, 2017; Firdaus *et al.,* 2015).

The years of schooling have a positive and significant effect in determining the expenditure share of animal-sourced food, processed food, and other foods. Mean-

while, the years of schooling have a negative and significant effect in determining the grain expenditure share. This is in line with (Kirk *et al.,* 2018; Ayyash & Sek, 2020), which stated that the education of heads of households has a positive effect on animal-sourced food expenditure share (beef and pork). Consumers with higher levels of education will have better access to information than consumers with low levels of education.

Households in rural areas also significantly affect the commodity groups of grains, animal-sourced food, and vegetables. Rural poor households in West Java have a larger expenditure share in grain and vegetables than poor households in urban areas. This is because rural areas have more access to both groups as rural households are identical to agricultural areas (Satterthwaite *et al.,* 2010). Meanwhile, the expenditure share of animal-sourced food is greater in urban than rural areas. This happens because poor households in urban areas prioritize their consumption in commodities with high nutritional content, namely in the animal-sourced food group.

The heads of households who work in the agricultural sector have a positive and significant effect on the commodity groups of grain, beans, and processed food. The heads of households who work in the agricultural sector have a positive and significant effect in determining the grain expenditure share. In contrast, beans and processed food have a negative effect. The positive effect on grains and beans and processed food is because grain is an agricultural-based commodity produced by the household. This condition is in line with Mayasari *et al.* (2018), which found that poor households working in the agricultural sector had a positive and significant effect in determining the expenditure share of rice/tubers, fish/meat/egg/milk, and other food commodities.

The Inverse Mills Ratio (IMR) parameter significantly affects 5-10 percent for animal-sourced foods, beans, and other foods. These indicated selectivity biases are present in animal-sourced food commodities, beans, and other foods, and the addition of the IMR makes it unbiased. However, IMR variables are not significant for the commodity groups of grains, vegetables, fruits, and processed food (Singh *et al.,* 2011), indicating no selectivity bias for these commodity groups. The instrumental variable parameters have a significant effect at the level of 1 percent. The total expenditure instrumental variable positively affects the expenditure share of the commodity groups except for the other-food commodity groups. This shows that most commodity group expenditure share is influenced by household income as the instrumental variable in this study.

Table 4 shows that the own-price elasticity of poor households in West Java for all food groups is negative, and almost all food commodities groups have a value of less than 1. Among the seven food groups, grain and beans are the most inelastic as it has the lowest own-price elasticity, 0.4277 and 0.4855, respectively. This occurs because rice, a component in the grain group, is a staple food for poor households and is almost consumed by all households. Thus, the price increase is less responded to by poor households. This condition aligns with Bennet's law, which states that households switch consumption from cheaper to more expensive calorie sources as income rises (Pangaribowo, 2014; Fuglie, 2004). However, in line with the in-

creased income, food consumption will become more diversified and consume more commodities with high nutritional value. Meanwhile, other groups, such as processed food, have a price elasticity close to 1, equal to 0.9364, which means that the increase in food prices is almost proportional to the consumption decrease of these food commodities. This is consistent with (Widarjono & Rucbha, 2016), which stated that elasticity in poor households tends to be responsive to price changes compared to high-income households as poor households have low purchasing power. The commodity groups are inelastic as it has a value of less than 1. However, fruit and processed food in urban households are elastic with 1.2107 and 1.0022, respectively. This is in line with previous research, which found that the own-price elasticity of food in urban areas is elastic (Vu, 2020; Faharuddin *et al.,* 2017). This occurs as fruits supply in urban areas depends on the season. In a specific fruit harvest season, many supply that fruit, thus dropping its price and consequently increasing the fruit consumption. On the contrary, there is less supply during the non-harvest season, increasing prices and sharply decreasing consumption.

TABLE 4

Comparison of the Own-price Elasticity Value of Poor Households in West Java Province by Household location and Type of Work of Head of Households

Commodity Group	Total Households	Rural	Urban	Non-Agricultural	Agricultural
Grain	-0.4277	-0.4623	-0.3963	-0.4581	-0.4140
Animal-sourced Food	-0.8073	-0.8245	-0.8130	-0.8520	-0.7794
Vegetables	-0.7788	-0.7443	-0.8176	-0.7510	-0.7868
Beand	-0.4885	-0.6050	-0.3717	-0.5622	-0.4527
Fruits	-0.7511	-0.3691	-1.2107	-0.2473	-0.8986
Processed food	-0.9364	-0.7790	-1.0022	-0.6939	-0.9956
Other Food	-0.8318	-0.9653	-0.7143	-0.9737	-0.7216

Source: BPS (2017), own calculations.

The commodity groups are inelastic as it has a value of less than 1. However, fruit and processed food in urban households are elastic with 1.2107 and 1.0022, respectively. This is in line with previous research, which found that the own-price elasticity of food in urban areas is elastic (Vu, 2020; Faharuddin *et al.,* 2017). This occurs as fruits supply in urban areas depends on the season. In a specific fruit harvest season, many supply that fruit, thus dropping its price and consequently increasing the fruit consumption. On the contrary, there is less supply during the non-harvest season, increasing prices and sharply decreasing consumption.

Similar conditions also occur based on the type of work of the head of household. For head of households working in the agricultural sector, the most inelastic commodity groups are fruit and grain with an elasticity value of 0.2473 and 0.4581, respectively. Meanwhile, for head of households working in the non-agricultural sector, the most inelastic commodity groups are grains and beans with 0.4140 and 0.4527,

respectively. On the other hand, heads of households working in the non-agricultural sector have the processed food group with an elasticity close to 1, equal to 0.9956.

Table 5 shows the cross-price elasticity in the total poor households in West Java Province; most food commodity group cross-price elasticity have very small elasticity, ranging from 0.0101 to 0.5814. 29 out of the 42 cross-elasticity are negative, indicating those food groups are complementary. Meanwhile, the remaining 13 have positive values, indicating those food groups as substitutes. Grain is a basic necessity for all poor households in West Java Province. Cross-price elasticity in grain has more negative values than positive values, which shows more complementary than substitutive relations with other food commodities. This aligns with previous research, which found that rice had more complementary than substitutive relations with a minimal value of complementary elasticity (Miranti & Syaukat, 2016). Therefore, the demand for rice is not responsive to price changes of complementary goods, and price interference possibly will not substantially affect food demand (Siddique *et al.,* 2020).

TABLE 5

Comparison of Cross Price Elasticity of the Total Household, by Location and Type of Work of the Head of Household

Commodity Groups		Cross Elasticity				
		Total Households	Area		Households Head Work	
			Rural	Urban	Agricultural	Non-agricultural
Grain	Animal Sourced Food	-0.0227	0.0418	-0.0742	0.0199	-0.0463
	Vegetables	-0.0561	-0.0506	-0.0614	-0.0725	-0.0491
	Beans	0.0846	0.1163	0.0645	0.0852	0.0769
	Fruits	-0.0211	-0.0303	-0.0814	-0.1038	-0.0105
	Processed Food	-0.0085	-0.1285	0.1159	-0.1047	0.0298
	Other Food	0.0454	0.1877	-0.0481	0.2042	-0.0036
Animal Sourced Food	Grain	-0.2362	-0.4545	-0.0700	-0.4812	-0.1511
	Vegetables	-0.1318	-0.2050	-0.0507	-0.0540	-0.1526
	Beans	-0.2082	-0.0986	-0.3418	-0.1972	-0.1706
	Fruits	0.2141	0.2758	0.2064	0.2054	0.1960
	Processed Food	0.0535	-0.2093	0.1241	-0.1899	0.1062
	Other Food	-0.0276	-0.1252	0.0341	0.1532	-0.0631
Vegetables	Grain	-0.5814	-0.6989	-0.4748	-0.9391	-0.4517
	Animal Sourced Food	-0.0556	0.2366	-0.0107	0.0031	-0.0628
	Beans	0.0132	-0.0566	0.0848	0.0953	-0.0058
	Fruits	-0.0139	0.1267	-0.0329	0.2823	0.0976
	Processed Food	-0.1502	0.0808	-0.2793	-0.1715	-0.1503
	Other Food	-0.3085	0.6891	-0.2229	-0.6897	-0.2287
Beans	Grain	-0.0527	-0.0142	-0.1848	0.0844	-0.1306
	Animal Sourced Food	0.0294	0.0321	0.0329	-0.0223	0.0421
	Vegetables	0.0241	0.0132	0.0194	0.0314	0.0143

Commodity Groups		Cross Elasticity				
		Total Households	Area		Households Head Work	
			Rural	Urban	Agricultural	Non-agricultural
Fruits	Fruits	0.1522	-0.0377	0.2648	0.1796	0.1596
	Processed Food	-0.3832	-0.5476	-0.4203	-0.3268	-0.4268
	Other Food	0.0798	0.2688	0.1245	-0.0815	0.1560
	Grain	0.0865	0.0747	0.1240	0.0839	0.1137
	Animal Sourced Food	-0.0631	-0.3997	0.2442	-0.1438	-0.0388
	Vegetables	-0.0503	-0.1956	0.0633	-0.0814	-0.0191
	Beans	-0.0313	-0.2973	-0.0520	-0.0419	-0.0517
Processed Food	Processed Food	-0.1293	0.8526	-0.6485	0.2366	-0.1994
	Other Food	0.0101	-0.5164	0.3068	-0.6852	0.2914
	Grain	-0.2308	-0.1088	-0.2952	-0.0769	-0.2635
	Animal Sourced Food	-0.0232	-0.0512	-0.0110	-0.0603	-0.0115
	Vegetables	0.0623	0.0874	0.0353	0.0496	0.0607
	Beans	-0.0052	-0.0250	0.0247	-0.0669	0.0087
Other Food	Fruits	-0.0623	-0.0602	-0.0466	-0.0899	-0.0477
	Other Food	-0.0412	-0.0397	-0.0595	-0.0674	-0.0544
	Grain	-0.1302	-0.4254	0.0281	-0.4709	-0.0121
	Animal Sourced Food	-0.0582	-0.0186	-0.0657	0.0010	-0.0843
	Vegetables	-0.0780	-0.0580	-0.0771	-0.0509	-0.0702
	Beans	-0.2815	-0.2660	-0.2541	-0.0792	-0.3667
	Fruits	-0.0768	-0.0460	0.0808	-0.0047	-0.0925
	Processed Food	0.0536	0.1155	0.3027	-0.3570	0.1697

Source: BPS (2017), own calculations.

Grain has the largest substitution relationship with bean, valued at 0.0846. This means an increase in grain price will increase bean demand, implying a shift in consumption where grain can be slightly replaced by bean. Meanwhile, grain has complementary relationships with animal-sourced food groups, vegetables, fruits, and processed foods, implying an increase in grain price can decrease the demand for all food except for beans and other foods. The biggest complementary relationship is with vegetables, worth 0.0561. Thus, a price increase in grain can decrease vegetable demand. This aligns with previous research, which states that an price increase in rice (one component of grain) will reduce the consumption of milk, tubers, meat, fruits but increase the consumption of beans (Faharuddin *et al.,* 2017).

The processed food commodity group is the highest food expenditure share of poor households in West Java, with a complementary relationship to all commodity groups except vegetables. The strongest complementary relationship is with grain with a cross-elasticity of -0.2308, implying that a price increase in processed food can decrease grain demand. Meanwhile, the only substitution relationship of processed food groups is with vegetables, with an elasticity of 0.0623, implying a price increase in processed food can increase vegetable demand by 0.0623 percent, *ceteris paribus*. Household location and the work type of household head show that grain

has a substitutitive relationship with animal-sourced food, beans, and other food. The greatest substitution elasticity is processed food with 0.1877, implying a 1 percent increase in grain price will increase processed food demand by 0.1877 percent of heads of households working in the agricultural sector, *ceteris paribus*. This aligns with previous research that found a shift in consumption patterns in poor households, where grain was slightly replaced by processed food (Mayasari *et al.,* 2018).

In households whose head of household works in the agricultural sector, grain has a substitutive relationship with animal-sourced food, beans, and other food. The largest substitution elasticity is in the other-food group with 0.2042, implying a 1 percent grain price increase can increase the other-food group demand by a 0.2042, *ceteris paribus*. This condition occurs as the heads of households working in the agricultural sector have low incomes (Tulangow *et al.,* 2017). The shift in consumption patterns showed grain replaced by the other food group (noodles being one component in the other food group). This is in line with Mayasari *et al.* (2018), who found that grain in poor households was slightly replaced with the other food group.

TABLE 6

Comparison of Income Elasticity of Poor Households in West Java Province by Household Location and Type of Work of Heads of Household

Commodity group	Total Households	Rural	Urban	Agricultural	Non-agricultural
Grain	0.3636	0.3072	0.3998	0.3990	0.3349
Animal Sourced Food	0.0133	0.0916	-0.0277	-0.0027	0.0337
Vegetables	0.2674	0.3575	0.2072	0.3557	0.2354
Beans	0.2926	0.4662	0.1595	0.4084	0.2472
Fruits	0.5242	0.5616	0.6303	0.4903	0.5153
Processed Food	2.1166	2.1844	2.0571	2.1929	2.0764
Other Food	0.9919	1.0849	0.9441	1.0866	0.9526

Source: BPS (2017), own calculations.

Estimation shows a positive value of the overall expenditure elasticity of poor households (see Table 6). This means that there are no inferior items to poor households in West Java Province. All food commodities are normal goods, and some of them fall into the category of luxury goods. This condition is in line with Colen *et al.* (2018), which found that food groups had a positive expenditure elasticity, including normal goods and luxury goods. Table 5 shows that processed food has the highest elasticity with an average of 2.6567, implying an income increase will be allocated more to consume processed food. This is expected as many businesses provide food and beverages in each area. This result is in line with previous research that concluded that the poorer the household's economic status, the more responsive the income elasticity of processed food (Widarjono & Rucbha, 2016).

The lowest expenditure elasticity in poor households as a whole is found in animal-sourced food. These conditions indicate that animal-sourced food is needed for poor households in West Java Province and is included in their daily consumption. One component in the group is salted fish. Aside from its affordable and accessible price, it is consumed regardless of age, from children, adults, and parents. It is one of the favorite foods for poor households in West Java province. However, Le (2008) found that the lower the level of household income, the higher the income elasticity of animal-sourced food, indicating it to be a luxurious commodity. Colen *et al.* (2018) showed that a higher level of income results in lower elasticities for calorie demand and food demand in general.

Based on the household location, the expenditure elasticity of most urban poor households is lower and positive (except for animal-sourced food groups) compared to poor households in rural areas. This indicates that animal-sourced food is more affordable for poor households in urban areas as it has a higher average income than rural areas. This aligns with previous research that found food expenditure in urban areas was lower than in rural areas. The value for all food groups was positive and was characterized as normal goods (Kosaka *et al.,* 2018; Putra *et al.,* 2020).

Households living in urban and rural areas showed that animal-sourced food has a negative expenditure elasticity, implying it is an inferior good for poor households in urban areas and poor households with heads of houses working in the agricultural sector. An increase in household income will decrease demand for animal-sourced food. Households will choose to buy better group commodities even with a higher price, for example, switching to the processed-food group.

4. Conclusion

Several findings can be concluded. Firstly, most of the own-price and the prices of other commodities have a significant effect (positive and negative) in determining the expenditure share for all food groups of poor households, except for fruit. Secondly, the own-price elasticity value shows that almost all food groups have a negative and less than 1 own-price elasticity. Among the seven groups, grain and beans are the most inelastic because they have the lowest own-price elasticity value. The cross-price elasticity value of food groups in poor households in West Java Province is positive and negative, indicating that the related food group is complementary (negative elasticity) and substitutive (positive elasticity). In general, poor households view grain as a basic need, making it difficult to find substitute goods.

The overall expenditure elasticity of poor households shows a positive expenditure elasticity. This means that all existing commodity food groups are normal goods, with some categorized as luxury goods. Based on the household location, the expenditure elasticity of most commodity groups of urban poor households is lower and is positive (except for the animal-sourced food group) compared to poor households in rural areas. This indicates that the food price is more affordable for poor households in urban areas because the average income in urban areas is higher than in rural areas. In urban and rural households, animal-sourced food has a negative expenditure

elasticity, meaning it is an inferior good for poor households in urban areas and poor households with heads of household working in the agricultural sector.

Further research should calculate the expected dietary pattern or "Program Harapan" in West Java to see poor households' protein and calorie composition. It is necessary to include the expenditure of non-food commodities such as education and health to compare with the results of this study. Furthermore, analysis of compensating variation (CV) can be carried out for further research to determine the amount of money needed to keep the household at the previous level of utility.

This research has limitations, among others: (1) the existing empirical model of demand for many commodities cannot accurately describe the behavior between income groups and regions; (2) the relationship between expenditure and income (Engel curve) is not linear but quadratic to the log of income. Therefore, the Quadratic Almost Ideal Demand System (QUAIDS) can be used to improve the LA-AIDS model. Future studies can use the QUAIDS model because the model will differentiate community income groups. Finally, the research was carried out before the Covid-19 pandemic crisis. Future research is expected to pay attention to the current conditions of the Covid19 pandemic as the economy of West Java Province before and after the Covid19 crisis will be different.

5. Policy Implications

The research resulted in several policy implications related to poor households' food consumption: grain has the biggest expenditure share and is the main source of calories for poor households in West Java Province. Local governments should increase food diversification through programs and policies to reduce rice prices (a component in the grain commodities) at the consumer level. A decrease in rice prices will encourage households to consume a wider variety of food, positively impacting human health and productivity. One way is by shortening the rice distribution chain; the lower cost of marketing rice will result in lower consumer-level prices without reducing the welfare of farmers.

Second, food expenditure share is quite high and possibly increasing. Thus, there is a need for increased supervision of processed products and food to guarantee their comfort and safety.

Third, the LA-AIDS model's elasticity calculation shows that the price elasticity is greater than the expenditure elasticity. Therefore, the government should control food demand through food prices, namely reducing food prices to increase household food demand.

Fourth, to achieve good quality food for poor households, programs should continue to disseminate information about quality consumption patterns to poor households. Fifth, increasing the institutional role of marketing food products to stabilize food distribution and prices, especially in remote areas.

Finally, increasing promotion and advocacy activities, assisting the community regarding nutrition in realizing a good nutritional status starting from the smallest environment, namely the family, should be a priority.

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