Household consumption of broilers meat in Kudus Central Java

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Abstract. Broilers meat is one of protein intake sources from meat in Indonesia, but the consumption still very low compared to the standard set by Food and Agriculture Organization (FAO). This study investigates the pattern of animal food consumption, examines the determinants of broilers meat consumption and analyzes the demand elasticity in the household. This study uses Panel Data Analysis with Random Effect Model to estimate the factors influencing broilers meat consumption. The determinants are the number of family members, household income, the price of broilers meat, egg, rice, beef, fish, and the residential area. The results show that the most influential factor is the price of broilers meat, with inelastic demand elasticity.

1. Introduction

The current consumption of animal protein in Indonesia is still very low compared to the standards set by Food and Agriculture Organization (FAO) [1]. One of animal protein sources at a relatively affordable price and easily obtained is broilers meat [2]. Indonesian people like to consume broilers meat for their daily consumption. Although the price of broilers meat is volatile, this commodity is still popular. Chicken meat prices are relatively affordable and influenced by price fluctuations of other agricultural commodities, which depend on the season. In addition, chicken meat is very easy to find in the market [3]. However, the rate of consumption growth for broilers meat is still fluctuating from year to year, particularly in Kudus District with the highest inflation rate among Central Java regions [4]. Broilers meat is one of the commodities which contributes to inflation. Also, broilers meat has a big influence on urban poverty line value besides rice and other food commodities. Therefore, it is very important to investigate the household consumption of main food commodity in the areas where inflation is high.

Households in Kudus District have the highest average consumption of goods and services in Central Java [5]. Poultry is the most desirable food compared to beef, buffalo meat, and other meats [6]. Therefore, this study attempts to investigate the pattern of household meat consumption in Kudus District, focusing on broilers meat consumption and the sensitivity. This is the first study that examines the household consumption of broilers meat by using a monthly micro-data, thus provides a significant contribution on similar subject.

2. Theoretical Framework

In this study, the households are assumed to maximize their utility for broilers meat consumption. Household food consumption patterns are determined by the type and frequency of meals which reflect their eating habits. The criteria of frequency can be categorized as ‘often’ (4-6 times per week),
'quite often' (3 times per week), 'enough' (1-2 times per week), 'rare' (2-3 times per month), and 'very rare' once or less per month) [7]. The determinants of household consumption are divided into 2 factors, namely economic and non-economic factors [8]. The demand is defined on influencing factors consisting the price of its good and other goods, the number of population and income per capita. The relationship between demand and the influencing factors [9] is demonstrated in the equation (1). 

\[ Q_d = f(P, P_x, P_y, Y) \] (1)

Where \( Q_d \) is the demand for good, \( P \) is the price of the item, \( P_x \) is the price of substitute goods, \( P_y \) is the price of complementary goods, and \( Y \) is the income per capita. Then, the degree of sensitivity was measured by using the elasticity. Elasticity is a measure of a variable's sensitivity to a change in another variable. In business and economics, elasticity refers the degree to which individuals, consumers or producers change their demand or the amount supplied in response to price or income changes [3]. There are some types of elasticities, namely Price Elasticity (\( E_p \)), Cross Elasticity (\( E_c \)), and Income Elasticity (\( E_i \)). If the value of price elasticity (\( \varepsilon_p \)) is \( > 1 \), \( < 1 \), and \( = 1 \) hence classified as elastic, inelastic and unitary, respectively. Furthermore, the goods would be categorized as superior goods (luxury goods), basic goods or normal goods, and inferior goods if the elasticity of income is \( E_i > 1 \), \( 0 < E_i < 1 \), and \( E_i < 0 \), respectively. Then, the classification according to cross elasticity is substitute goods (\( \varepsilon_c > 0 \)), complementary goods (\( \varepsilon_c < 0 \)), and neutral goods (\( \varepsilon_c = 0 \) [10].

3. Methods

3.1. Empirical Model

In this study, 100 household samples were chosen, consisting of 50 respondents from each rural and urban areas, respectively. Based on the theoretical framework, the following empirical model was applied to estimate the determinants of household consumption [10] [11].

\[ \text{Ln}Y_{it} = \text{Ln} \beta_0 + \beta_1 \text{Ln}X_{it1} + \beta_2 \text{Ln}X_{it2} + \beta_3 \text{Ln}X_{it3} + \beta_4 \text{Ln}X_{it4} + \beta_5 \text{Ln}X_{it5} + \beta_6 \text{Ln}X_{it6} + \beta_7 \text{Ln}X_{it7} + d_1D_{it1} + d_2D_{it2} + d_3D_{it3} + v_{it} \] (2)

Where :
\( \beta_0 \) : Constant
\( \beta_i \) : Regression coefficient as variable of demand elasticity
\( \text{Ln}Y_{it} \) : Consumption of broilers meat (kg)
\( \text{Ln}X_{it1} \) : Number of family members (people)
\( \text{Ln}X_{it2} \) : Household income (IDR/month)
\( \text{Ln}X_{it3} \) : Broilers meat price (IDR/kg)
\( \text{Ln}X_{it4} \) : Chicken eggs price (IDR/kg)
\( \text{Ln}X_{it5} \) : Rice price (IDR/kg)
\( \text{Ln}X_{it6} \) : Beef price (IDR/kg)
\( \text{Ln}X_{it7} \) : Fish price (IDR/kg)
\( D_1 \) : Dummy for household head occupation
If the occupation has permanent employees = 1, otherwise = 0
\( D_2 \) : Dummy of household members under 10 years old
If there are household members under 10 years old = 1, otherwise = 0
\( D_3 \) : Dummy for region residence
If the households live in urban area = 1, otherwise = 0
\( \alpha \) : Unobserved effect
\( \mu_{it} \) : Error
\( v_{it} \) : Composite error term
\( i \) : Respondent-\( i \)
\( t \) : Month-\( t \)
3.2. Analytical methods
The protein intake pattern of household consumption from meat was analyzed by using a table of specific criteria according to food materials and the consumption frequency of animal protein (chicken eggs, broilers meat, beef and fish) [7]. The Panel data analysis was taken into account to estimate the factors that influence the consumption of local broilers meat, also to find out the sensitivity degree (elasticity) of household demand for broilers meat in Kudus District. The Breusch-Pagan test was applied to investigate the existing types of effects (Random Effects or Pooled Models) [11]. Due to the rejection of the null hypothesis of individual effects, the Ordinary Least Square (OLS) method was not employed. The Hausman test was implemented to investigate further types of effects (Fixed or Random Effects) on the functions of household consumption. Finally, the Random Effect Model was conducted and indicated by the preliminary results [11] [12].

4. Results and Discussion
This study was conducted in Kudus District where the Consumer Price Index (CPI) is the highest in all Central Java province. Household consumption of broilers meat in this district is the largest compared to other meats [5], thus high inflation may have an effect on the consumption [13].

Table 1 shows the pattern of household meat consumption which is calculated from the types of meals’ ingredients and frequency [8]. The type of food sources for protein intake from meat are seen from the food ingredients such as chicken eggs, broilers meat, beef, and fish. The most frequent consumed food stuffs is broilers meat. One household was categorized in ‘often frequency’, 15 households in quite frequent categories, 16 households in the fair category, 46 households in the rare category, and 22 households in the very rare category. Egg is the second top preferred commodity consumed, while the least consumed is beef (96% of households rarely consuming) because it is more expensive than other foodstuffs. Furthermore, households consider beef as luxury goods. The affordable price is the main reason for the household to consume broilers meat in various circles.

Table 1. Patterns (type and frequency) of household meat consumption

| Type      | Often | Often enough | Enough | Rarely | Very rarely | TOTAL |
|-----------|-------|--------------|--------|--------|-------------|-------|
| Egg       | 2     | 8            | 18     | 50     | 22          | 100   |
| Broilers meat | 1     | 15           | 16     | 46     | 22          | 100   |
| Beef      | 0     | 0            | 1      | 3      | 96          | 100   |
| Fish      | 0     | 5            | 4      | 28     | 63          | 100   |

Table 2 shows the estimation of equation (2) and illustrates the determinants of broilers meat consumption. This study found that all the independent variables jointly affected the consumption of broilers meat. The estimated parameter of the number of family members, household income, the price of broilers meat, egg, beef, fish, as well as the residential areas are positively significant to the consumption of broilers meat (p < 0.05). While the estimated parameter of rice price is negatively significant to it. On the other hand, household head occupation and the presence of children under 10 years old do not affect the consumption (p < 0.05).

There are positive relationships between number of household members, household income, broilers meat price, beef price, fish price, and the consumption of broilers meat. This indicates that the increase values of those variables would lead to the increase of broilers consumption. In contrast, the increase of rice price causes broilers meat consumption to decrease. The most influential factor is broilers meat price, indicated by the biggest regression coefficient (0.671). The demand of broilers meat easily changes due to the price changes [14]. The dummy of region residence is positively effecting the broilers meat consumption. It is suggested that households who live in urban areas consume more broilers meat than those in rural areas. This finding is in line with a certain previous study [15].

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Table 3 presents the sensitivity/elasticity of demand for consumption of broilers meat. It can be seen that the income elasticity is 0.035, indicating that an increase of household income by 1% will lead to demand increase by 0.035%. The income elasticity is positive, indicating broilers meat is categorized as basic goods, where the demand will increase when the income increases [16]. Furthermore, the cross elasticity of egg, beef, and fish prices are 0.013, 0.007, and 0.005, respectively. This means if the beef price rises by 1% leads to the increasing demand of broilers meat by 0.013% and vice versa. It also means if fish price rises by 1%, the demand for broilers meat will increase by 0.005% and vice versa. The cross elasticity of beef and fish prices are positive, indicating beef and fish are the substitutes of broilers meat (Ec>0). The cross elasticity of rice price is −0.062, means the increase in rice price by 1% leads to the decrease of demand for broilers meat by 0.062% and vice versa. The cross elasticity of rice price is negative, indicates that rice is a complementary for broilers meat (Ec<0).

Table 2. Determinants of broilers meat consumption in Kudus district

| Variable                              | Regression Coefficient | Standard Error | P > |z|  |
|----------------------------------------|------------------------|----------------|------|---|---|
| (Constant)                             | −7.110***               | 0.436          | 0.000|   |   |
| Number of Household Member (X₁)       | 0.099**                 | 0.045          | 0.025|   |   |
| Household Income (X₂)                 | 0.038**                 | 0.017          | 0.022|   |   |
| Broilers Meat Price (X₃)              | 0.670***                | 0.013          | 0.000|   |   |
| Egg Price (X₄)                        | 0.013**                 | 0.005          | 0.003|   |   |
| Rice Price (X₅)                       | −0.061**                | 0.031          | 0.049|   |   |
| Beef Price (X₆)                       | 0.006**                 | 0.003          | 0.052|   |   |
| Fish Price (X₇)                       | 0.005**                 | 0.002          | 0.018|   |   |
| Household Head Occupation (D₁)        | 0.038ns                 | 0.027          | 0.152|   |   |
| Children Under 10 Years Old (D₂)      | −0.028ns                | 0.031          | 0.364|   |   |
| Residential Area (D₃)                 | 0.069**                 | 0.028          | 0.012|   |   |

Prob > Chi² = 0.0000 R² = 0.8572
Number of Observations = 1200 Hausman test = 0.9999
U = 100, V = 12 Breusch-pagan test = 0.0000

*Significant at 10% level; **Significant at 5% level; ***Significant at 1% level; nsNot significant

Table 3. Elasticity of broilers meat demand

| Variable                              | Elasticity |
|----------------------------------------|------------|
|                                        | Income     | Cross | Price |
| Household Income (X₂)                 | 0.035      |       |       |
| Egg Price (X₄)                        |            | 0.013 |       |
| Rice Price (X₅)                       |            | −0.062|       |
| Beef Price (X₆)                       |            | 0.007 |       |
| Fish Price (X₇)                       |            | 0.005 |       |
| Broilers Meat Price (X₃)              |            |       | 0.671 |

The elasticity of broilers meat price is 0.671, means that if the price increases by 1% the demand in broilers meat increases by 0.671% and vice versa. The price of broilers meat has a linear proportional relationship with the demand. The demand is inelastic, the changes of broilers meat demand smaller than that of its price[10]. This result is contrary to the law of demand [9]. This is due to the willingness to purchase broilers meat higher than that of other sources. Broilers meat consumption is influenced by seasonal events and local cultures such as holiday celebration including the Maulidan (Shura) tradition, Ruwah tradition (before Ramadan), Ramadan, Shawwal, then Christmas and New Year [16] [17]. This finding suggests that the responses of households are different according to common consumer behaviour. Due to the strong influence of local cultures, households buy broilers meat at a
high price to meet their important seasonal needs. Thus, the demand will increase even though the prices rise.

5. Conclusions
The estimation showed that broilers meat is the most frequent consumed meats compared to others. The determinants of broilers meat consumption are the number of family members, household income, broilers meat price, egg price, rice, beef, fish, and residence area. The most influential factor is the price of broilers meat since it directly affected the household purchasing power. Broilers meat is classified as staple goods (positive income elasticity). The value of cross elasticity indicates beef, eggs and fish are substitute goods of broilers meat, while rice is a complementary goods. Positive price elasticity indicating that broilers meat price has a direct proportional relationship to demand. In addition, such elasticity is inelastic, therefore it is suggested that the changes of broilers meat demand have a smaller percentage than that of price.

References
[1] Syafrizal M, Ciptadi G, and Budiarto A 2017 J. Ternak Tropika 18 1 pp 51-57
[2] Khomsan A 2010 Food and Nutrition for Health (Jakarta : Raja Grafindo Persada)
[3] Pracoyo T K and Antyo P 2006 Basic Aspects of Microeconomics (Jakarta : Raja Grafindo Persada)
[4] Ditjen PKH Kudus 2017 Food Security Database http://www.kuduskab.go.id/p/69/databased_ketahanan_pangan
[5] BPS Jawa Tengah [Central Bureau of Statistics Central Java] 2016 Official News Statistics: Development of the Consumer Price Index/Inflation in Central Java No. 81/12/33/th. XI
[6] BPS Kudus [Central Bureau of Statistics Kudus District] 2017 Kudus District in Figures 2017 Official Gazette of Statistics (Statistical Data)
[7] Kusumawati T D, Marwanti S, Ani S W 2013 Staple Food Availability Analysis and Rice Food Household Consumption Pattern in Nogosari District, Boyolali District (Surakarta : Faculty of Agriculture UNS)
[8] Supartono K A and Mochamad A 2011 J. Indonesian Applied Economics 5 1 pp 44-56
[9] Sukirno S 2005 Introduction to Microeconomics Theory (Jakarta : Raja GrafindoPersada)
[10] Antriyanadarti E 2012 Microeconomics for Agricultural Economics (Yogyakarta : Nuha Litera)
[11] Baltagi B H 2005 Economic Analysis of Panel Data3rd Edition (New York: John Wiley & Sons Inc.)
[12] Park H M 2011 Practical Guides to Panel Data Modeling: A Step-by-Step Analysis Using Stata (Minami Uonuma: International University of Japan)
[13] Ermon M N 2012 J. Kajian Ekonomi 1 1 p 4
[14] Yildirim I and Ceylan M 2008 Urban and Rural Households’ Fresh Chicken Meat Consumption Behaviors in Turkey Nutrition & Food Science 38 2 pp 154-163
[15] Sukirno S 2005 Modern Microeconomics (Jakarta : Raja Grafindo Persada)
[16] Ministry of Trade 2013 Report of Dynamics Analysis of Indonesian Food Consumption (Jakarta: Centre of Domestic Trade Policy-Ministry of Trade)
[17] Ani S W and Antriyanadarti E 2018 IOP Conf. Ser.: Earth Environ. Sci. 142 012057