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An Analysis on The Demand of Broiler's In The City of Manado, North Sulawesi Province – Indonesian

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Abstract: The research is aimed to analysis on determining factors of meat demand of domestic chicken in the City of Manado. It thus uses quantitative analysis using regression data of time series during 26 (twenty-six) years, from 1990 to 2015, comprising of: total demand of the broiler's meat, price of the broiler's egg, price of tuna, price of chili, edible oil, and income per capita. In detail, data sources are derived from Statistic Central Agency (BPS) of North Sulawesi, Service of Food of the City of Manado, and Service of Agriculture and Veterinary of North Sulawesi Province. As a result, it is found that total demand of the broiler's meat, price of the broiler's egg, price of tuna, price of chili, edible oil, and income per capita hada significant role on the demand of the broiler's meat in the City of Manado. Thus, price elasticity of the broiler's meat, price of other goods, and income per capita were inelastic, showed by the value of elasticity was smaller at 1 (one), where the demand of the broiler's meatwas insensitive on the changing of its price, price of other goods (price of the broiler's egg, price of tuna, price of chili, and edible oil), and income per capita. If the price of those goods and income per capita increased as 1%, so the demand of the broiler's meat would change much smaller than 1 %. In addition, the broiler's egg and tuna were substitute goods for the broiler's meat, while chili and edible oil were complementary. The broiler's meat were normal goods for society in the City of Manado.
Keywords: Demand, broiler's meat, price, income per capita

I. Introduction

The broiler's meatis one of food commodities derived from poultry, which is significant in fulfilling public's nutritional necessity. Thus, the demand for it is increasing in line with the growth of population, income, improvement education level, life style changing, and increasing awareness of balanced nutrition. Some factors influencing the broiler's meat as a favorite food and well-liked by Indonesian are: (1) having better taste and texture quality (*organoleptic*) (2) various availabilities and easy to cook (*convenience food*), and (3) providing affordable price than other veterinaryproducts[8] [11] [12] [13]

In the City of Manado, the demand of the broiler's meat tends to increase.[5] and [6] showed that the consumption of the broiler's meat in the City of Manado was continuously increasing by the increasing rate of 1,02 percent/year. Compared with other districts/cities, the highest consumption level of the broiler's meat in the City of Manado was 87,5 percent from the supply of the broiler's meat. Further, this situation depicts that City of Manado, astrategically territorial gate of North Sulawesi Province, is an area of consumption service rather than production area. It is supported with data of production growth and consumption on the broiler's meat in the City of Manado during 2011 – 2014, where its total of consumption was larger than total of production.

Meanwhile, price increasing and total of demand on the broiler's meat in the City of Manado also correspondingly occurredduring 2006 – 2015. However, it is against the law of supply that if price of certain goods increased, total of demand on certain goods would decrease. Contrastingly, if a price decreased, total of demand on such goods would increase [22] [23]. Other studies set out that total of demand on the broiler's meat was not only influenced by its price, but was also influenced by other factors, such as price of cow's meat, domestic chicken's meat, fish, edible oil, rice, total of population, avian influenza's outbreak and attribute of chicken's meat [10] [19] [3] [24]. For income, increasing of income resulted from price increasing caused increasing of public's purchasing power so that it effected on consumption increasing. It shows that total of commodity naturally consumed by was determined by the price of commodity itself, price of other commodities as substitution/complementary, and income. Hence, the final impact resulted on price changing to consumption level was depended on the amount of substitution effect and income obtained [16] [14].

In fact, economy and non-economy factors correspondingly influence the consumer's behavior. Therefore, the study on the development of demand on the broiler's meat in the City of Manado is highly

required for policy makers, researchers, and service users. According to above detail, the purpose of this research is to: (1) analyze factors determining the demand of the broiler's meat in the City of Manado, and (2) investigate the elasticity of the broiler's meat demand in the City of Manado.

II. Methodology

Theoretical Framework

The function of demand is lowered down from the function of consumer utility, maximized by the indifference of income level. If consumer is assumed to obtain satisfaction form consuming two types of commodity (the broiler's meat and egg) and other commodities are considered constant, then the function of consumer utility [17] [21]:

$$U_{br} = U_{br}(Q_{br}, Q_{lr}; Q_{ll}) \dots\dots\dots\dots\dots\dots\dots\dots\dots(2.1)$$

where:

U_{br} = total of utility consuming the broiler's meat
Q_{br} = total of demand on the broiler's meat
Q_{lr} = total of demand on the broiler's egg
Q_{ll} = total of demand on other commodities assumed constant

As there is an option to allocate income between two commodities, such as the broiler's meat and egg, so consumer will probably: (1) expense all his/her income for two commodities, and (2) choose one combination where marginal rate of substitution (the slope of indifference curve) of two commodities is equal with price of two commodities.

If the price of the broiler's meat is P_{br} and its egg is P_{lr}, so the function of indifference on certain level income is (Y):

$$Y = P_{br}{}^*Q_{br} + P_{lr}{}^* Q_{lr}\dots\dots\dots\dots\dots\dots\dots\dots\dots(2.2)$$

From above equation, it is known that the slope of indifferent budget as follows: $-\dfrac{Y/P_{lr}}{Y/P_{br}} = -\dfrac{P_{br}}{P_{lr}}$

by substituting the function of indifference (2.1) into the function of utility (2.2), then it is gained the function of Lagrangian, as follows:

$$V = U_{br}(Q_{br}, Q_c) + \lambda\,(Y^0 - P_{br}{}^*Q_{br} - P_{lr}{}^*Q_{lr})\dots\dots\dots\dots\dots\dots(2.3)$$

where λ = Lagrange Multiplier

Afterward, it maximizes utility by condition that first derivation is equaled with zero, as follows:

$$\partial V/\partial Q_{br} = \partial U_{br}/\partial Q_{br} - \lambda P_{br} = 0 \text{ atau } \partial U_{br}/\partial Q_{br} = \lambda P_{br}\dots\dots\dots\dots\dots(2.4)$$
$$\partial V/\partial Q_{lr} = \partial U_{br}/\partial Q_{lr} - \lambda P_{lr} = 0 \text{ atau } \partial U_{br}/\partial Q_{lr} = \lambda P_{lr}\dots\dots\dots\dots\dots(2.5)$$
$$\partial V/\partial \lambda \qquad = Y - P_{br}{}^*Q_{br} - P_{lr}{}^*Q_{lr} = 0 \dots\dots\dots\dots\dots\dots(2.6)$$

by dividing the equation (2.4) and (2.5):

$$\frac{\partial U_{br}\big/\partial Q_{br}}{\partial U_{br}\big/\partial Q_{lr}} = \frac{\lambda P_{br}}{\lambda P_{lr}} = \frac{P_{br}}{P_{lr}} = MRS = \frac{MU_{Qbr}}{MU_{Qlr}}$$

from (2.4) $\partial U/\partial Q_{br} = \lambda P_{br}$ $\lambda = \dfrac{\partial U\big/\partial Q_{br}}{P_{br}} = \dfrac{MU_{Qbr}}{P_{br}}\dots\dots\dots\dots\dots(2.7)$

from (2.5) $\partial U/\partial Q_{lr} = \lambda P_{lr}$ $\lambda = \dfrac{\partial U\big/\partial Q_{lr}}{P_{lr}} = \dfrac{MU_{Qlr}}{P_{lr}}\dots\dots\dots\dots\dots(2.8)$

therefore: $\dfrac{MU_{Qbr}}{P_{br}} = \dfrac{MU_{Qlr}}{P_{lr}}\dots\dots\dots\dots\dots(2.9)$

If the price of the broiler's meat and egg is constant, the marginal satisfaction of consuming the broiler's meat and egg is proportional with their price. Consequently, if it is showed that $P_{br}=P_{lr}$, so $MU_{Qbr}=MU_{Qlr}$. From equation in (2.7), (2.8), and (2.9), it is known that P_{br}, P_{lr}, and Y are exogeny variable, and Q_{br} and Q_{lr} are endogeny variable. Subsequently, the demand of the broiler's meat by consumer functionally can be formulated as follows:

$$Q^D{}_{br} = Q^D{}_{br}(P_{br}, P_{lr}, Y)\dots\dots\dots\dots\dots\dots\dots\dots\dots(2.10)$$

III.   Research Method

Type of this research data was secondary data (time series) for 26 years starting from 1990 to 2015, comprising of: total demand of broiler's meat, price of broiler's egg, price of tuna, price of chili, edible oil, and income per capita. Hence, data sources were derived from [1][4] [6].This research then used quantitative analysis using regression data of time series. Data analyzing used an assistance of E-Views 9 software. To answer the research's objectives, it used analysis of multiple linear regression, by mathematical function as follows:

$PDM = f(HDA, HTA, HIK, HCR, HMG, PKP)$ …………………………………………………………………(1)

where, Demand of the Broiler's Meat in the City of Manado was as dependent variable, and Price of the Broiler's Meat (HDA), Price of the Broiler's Egg (HTA), Price of Tuna (HIC), Price of Chili (HCR), Price of Edible Oil (HMG), and Income per Capita (PKP). Further, the model was stated in the model of log linear by transforming its variables. This transformation was performed by algorithmizing the equation (3.1), so the model was changed into linear form, as follows:

$Log(PDM) = \beta_0 - \beta_1 log(HDA) + \beta_2 log(HTA) + \beta_3 log(HIC) + \beta_4 log(HCR) + \beta_5 log(HMG) + \beta_6 log(PKP) + e$
……..(2)

where:
PDM	= Demand of the Broiler's Meat in the City of Manado (Kg)
HDA	= Price of the Broiler's Meat in the City of Manado (Rp/Kg)
HTA	= Price of the Broiler's Egg in the City of Manado (Rp/Kg)
HIC	= Price of Tuna (Rp/Kg)
HMG	= Price of Edible Oil (Rp/Kg)
PKP	= Income of per Capita (Rp/Year)
e	= Term of Error

IV.   Finding and discussion

3.1. Development of Factors Determining the Demand of the Broiler's Meat in the City of Manado

The demand and price of the broiler's meat in the City of Manado during 2006-2015 was fluctuated, yet it tended to increase by its growth respectively of 5,13and 4,45 percent. This growth of demand in the City of Manado from 2006-2015 can be seen from following Figure 1.
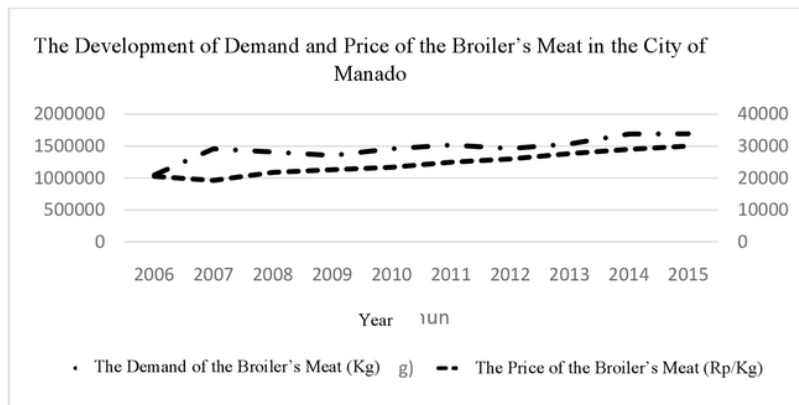
Figure 1. The Development of Demand and Price of the Broiler's Meat and Egg in the City of Manado During 2006 - 2015

Regarding on other goods price, such as price of the broiler's egg, tuna, and chili, those variables are determined by the demand of the broiler's meat in the City of Manado. An average increasing per year during 2006-2015, respectively, was 7,86%, 6,32 %, 19,55 %, and 7,45%. Trend of development on the broiler's egg, tuna, chili, and edible oil is shown in the Figure 2. Besides of other goods price, income per capita of the people in the City of Manado also determines the demand of the broiler's meat in the City of Manado. The increasing income per capita is one of signs that people's welfare has increased. The data taken from this research is the dividing result of Gross Regional Domestic Product (PDRB) with total of population in the City of Manado. In this following Figure 3, it shows the development of income per capita in the City of Manado.
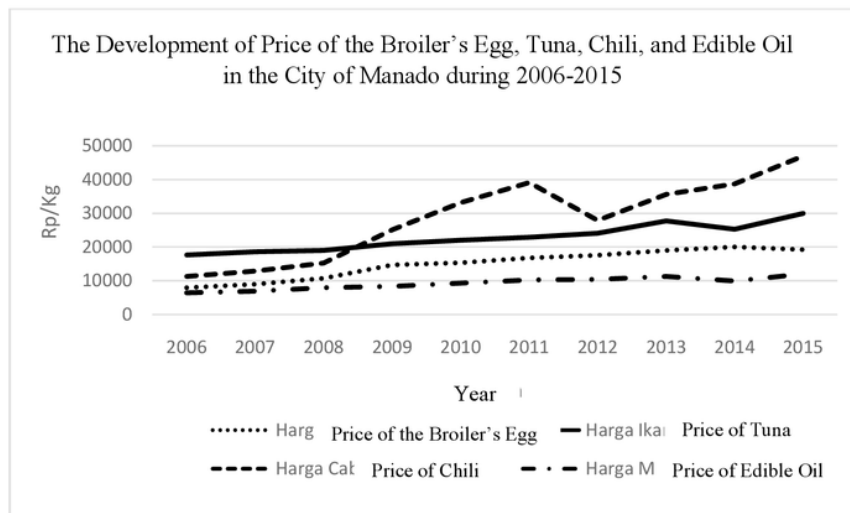
The Development of Price of the Broiler's Egg, Tuna, Chili, and Edible Oil in the City of Manado during 2006-2015

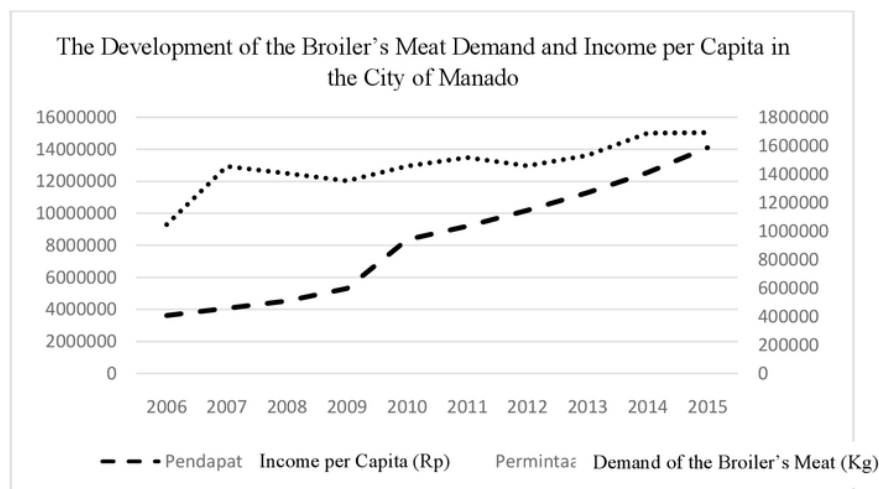**Figure 2.**The Development of Price of the Broiler's Egg, Tuna, Chili, and Edible Oil in the City of Manado during 2006-2015

The Development of the Broiler's Meat Demand and Income per Capita in the City of Manado

Figure 3. The Development of the Broiler's Meat Demand and Income per Capita in the City of Manado during 2006 – 2015

3.2. Determining Factors of the Demand on the Broiler's Meat in the City of Manado

The analysis result of linear regression model is as follows: PDM = 6,305 - 0,533 HDA + 0,349 HTA + 0,108 HIK – 0,360 HCR – 0,587 HMG + 0,622 PKP

This model shows a depiction that the demand of the broiler's meat (PDM) in the City of Manado was influenced by the price of the broiler's meat (HDA), price of the broiler's egg (HTA), price of tuna (HIK), price of chili (HCR), price of edible oil (HMG), and income per capita (PKP) (Table 1).

Table 1. Result of Regression Analysis on the Demand of the Broiler's Meat in the City of Manado

Independent Variable	Coefficient	t-value	Probability
Constant	6,305	3,038	0,006
Price of the Broiler's Meat	-0,533	-3,643	0,001
Price of the Broiler's Egg	0,222	1,131	0,027
Price of Tuna	0,108	0,183	0,085
Price of Chili	-0,360	-1,780	0,091

Price of Edible Oil	-0,587	-1,731	0,099
Income per Capita	0,662	4,711	0,000
Adjusted R^2			0,901
F- value			0,000

Coefficient of negatively regression for variables of price of the broiler's meat, chili, and edible oil shows if each variable increased of 1 percent, so the demand of the broiler's meat decreased respectively as 0,533, 0,360, and 0,587 percent. In contrast, for price of the broiler's egg, tuna, and income per capita, it showed positively regression coefficient. If each variable roseat1 percent, it would be followed by the increasing of the broiler's meat demand respectively as 0,349, 0,108, and 0,622 percent.

Concerning the elasticity, the analysis result depicts that the elasticity value of the price of the broiler's meat and egg, tuna, chili, edible oil, and income per capita was smaller at 1 (inelastic). The elasticity value ranging from zero to one shows that the changing percentage of total of the broiler's meat demanded was smaller than the each changing of six independent variables. Thus, total of the broiler's demand would change if those six prices of the broiler's meat andegg, chili, edible oil, and income per capita also changed, but the amount of changing proportion on total of the broiler's meat was smaller than the amount of the changing proportion of those six variables. It was in vein with the research conducted by [15] [18] where the elasticity value was smaller at one. However, this research was different from [9].

A positive regression coefficient for price of the broiler's egg and tuna showed that among price of the broiler's meat and tuna, and between the price of broiler's meat and tuna had substitution relation. The increasing of the price of the broiler's meat and tuna would increase total demand of the broiler's meat in the City of Manado. If average price of the broiler's egg and tuna in the City of Manado increased, so public would consume the broiler's meat (*ceteris paribus*). Similarly, this substitution relation of the broiler's meat and egg is in line with [2] [7] [21], yet it is different from the research conducted by [20] [15].This was caused by a significant difference of consumption pattern in each region. While, the substitution relation of the broiler's meat and tuna is in accordance with [9] for the price of fish in the Southeast Sulawesi, yet it is different from the result of [20] in the Province of Sumatera. The difference is related to region condition and society's local characteristic. The City of Manado hence is coastal area having large number of fish's availability and fish-eating habit. Contrastingly, most of Sumatera's regions are mainland and the people have less appetite in eating fish.

Moreover, a negative regression coefficient for the variable of price of the chili and edible oil defined that chili and edible oil were complementary goods on the broiler's meat. If price of chili and edible oil rose increased resulting on decreasing total demand of those two variables, it would result on decreasing total demand of the broiler's meat. It was triggered that chili and edible oil were used altogether with the broiler's meat in various dishes of the people in the City of Manado.

In detail, then, the elasticity value was smaller as one and positive for income per capita variable showing that the broiler's, for the people in the City of Manado, was primary needs and normal goods. This result is in line with the finding of [15] concluding that the increasing of people's income resulted on the increasing demand of the broiler's meat.

V.   Conclusion

1. Price of the broiler's meat and egg, tuna, chili, edible oil, and income per capita have significant role on the demand of the broiler's meat in the City of Manado.
2. The price elasticity of the broiler's meat, other goods, and income per capita is inelastic defined by smaller elasticity value at 1, where the demand of the broiler's meat was insensitive on its price changing, other goods price (price of the broiler's egg, tuna, chili, and edible oil), and income per capita. If the price of those goods and income per capita increase of 1 percent, so the demand of the broiler's meat experiences smaller changing of 1 percent.
3. The broiler's egg and tuna are substitution goods for the broiler's meat, while chili and edible oil are complementary goods. Thus, the broiler's meat is normal goods for the society in the City of Manado.

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