ANALYSIS OF TEMPEH DEMAND IN INDONESIA IN 2007-2022

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ABSTRACT

This research is a quantitative research with the title: "Analysis of Tempeh Demand in Indonesia 2007-2022". The purpose of this study was to determine the effect of population, per capita income, soybean prices, and egg prices on tempeh demand. The object of study includes the population, per capita income of the community, the price of imported soybeans, and the price of eggs. The subject of the study is the country of Indonesia. The research time span is 2007 to 2022.

Based on the results of research and data analysis using multiple linear regression analysis shows that; (1) population variables have a positive and significant effect on tempeh demand, (2) imported soybean price variables have a negative and significant effect on tempeh demand, (3) per capita income variables and egg prices do not have a significant effect on tempeh demand. Based on Test F, the independent variables (population, per capita income, soybean price, egg price) have a significant effect simultaneously (together) on the dependent variable (tempeh demand).

The implication of the above conclusion is that to compensate for the need for tempeh, a program should be held to increase the production of imported soybeans intended to meet national soybean needs which tend to increase as a result of increasing population and community income, as well as increasing public knowledge about the nutritional content of some food products made from soybeans. The program is expected to reduce dependence on soybean imports and can increase tempeh production which can ultimately increase domestic food security so that food self-sufficiency can be realized.

Keywords: Demand, Consumer, Influence, Factors

1. Introduction

Indonesia has a large enough population which in meeting the food needs of its population is very complex (Rahmawati et al., 2020). Food security in a country is said to be good if all residents in a country can meet their needs. This makes food a central issue in the life of the nation and state, so that food security issues should be made a priority (Wicaksono, 2012).

One of the top three major food commodities in Indonesia besides rice and corn is soybeans. The availability of soybeans in Indonesia is important because almost 90 percent is used for food (Atman, 2014). Soybeans are a source of vegetable protein at an affordable price for most Indonesians. Although the domestic demand for soybeans is very high, most of them are imported soybeans from the United States. Indonesia's soybean production in 2021 is 200,315 tons, while the needs of the soybean industry are around 2.8 million tons. This shows that domestic soybean

needs cannot be met by soybean production. According to the Central Statistics Agency (BPS), soybeans are the food commodity with the largest import volume.

The growth of the food industry and direct consumption that continues to increase along with population growth causes domestic soybean needs to continue to increase every year in line with the increasing public consumption of tofu and tempeh, as well as the supply of soy sauce industry. The calculation of total soybean consumption in Indonesia is obtained from the conversion of processed soybean forms such as tofu, tempeh, and soy sauce to soybean equivalent forms (Ministry of Agriculture Data and Information Center, 2022). The form of processed soybeans that is converted to the most soybean equivalent form is tempeh.

The content in tempeh that is good for the body makes tempeh consumption relatively high. According to Todaro & Smith (2012), stated that when the world's population increases, the need for food will also increase, including tempeh as food. According to Zakiah (2011) and Sagala et al. (2020) stated that partially the population has a positive and significant effect on soybean demand. Along with the increasing population, Indonesia's per capita income level also increases. Income is one of the factors that determine the demand for an item. According to research by Bianridha et al. (2022), consumer income can have a real influence on the amount of demand for tempeh chips in the Tempe Chip Center, Kedung Jenar, Blora Regency.

In addition to population and per capita income, tempeh demand is also influenced by several other factors, including the price of imported soybeans as raw material for tempeh. When the price of imported soybeans is high, it will increase the cost of tempeh production which ultimately increases the selling price of tempeh. In the research of Kotler et al. (2009), stated that price is one of the determining factors in demand, meaning that the more expensive the price of a product tends to be demand by consumers the lower, conversely, the cheaper or more affordable the price of a product, the greater the demand. In addition to tempeh, other high-protein foods that are widely consumed by people are eggs. Eggs are indicated as a substitute for tempeh. The high price of eggs as a substitute for tempeh will affect people's willingness to buy tempeh (Prasetyo et al., 2019).

From the background description above, this study deserves to be researched to analyze what factors affect the demand for tempeh as an ingredient in Indonesia. The novelty in this study is the use of tempeh demand as a benchmark for food security, research locations that refer to the national scale, namely Indonesia, the time taken in selecting data, and variables that have never been studied in previous studies.

2. Literature Review

2.1 Food Security

Food security is a multidimensional and very complex issue, covering social, economic, political, and environmental aspects. Based on Law No. 18 of 2012, food security is a condition of food fulfillment for the state up to individuals which is reflected in the relative availability of food, both in quantity and quality, safe, compound, nutritious, equitable, and affordable and not contrary to

religion, beliefs, and culture of the people, to be able to live healthy, active and productive lives sustainably.

According to the Food Security Agency (2005) and Webb & Rogers (2014), there are several indicators of national food security, namely food availability, food access, food absorption, and nutritional status.

2.2 Demand Theory

According to Mankiw (2018) in his book entitled "Principles of Economics", demand theory shows the relationship between the quantity demanded and the price of a commodity. The quantity demanded of each item is the number of items purchased and can be purchased. The law of demand states that "Other things are considered equal, when the price of goods rises, the quantity demanded of goods falls, and when prices fall, the quantity demanded rises". There are many factors that can affect demand, namely income, price of related goods, tastes, expectations, and number of buyers.

3. Research Methodology

3.1 Research Setting

This study used secondary data sourced from reports from the Central Statistics Agency (BPS) and the Ministry of Agriculture. The location in this study is Indonesia from 2007 to 2022. The analytical method used in this study is quantitative descriptive analysis using multiple linear regression analysis. Variables in this study include population, per capita income, imported soybean prices, and egg prices as dependent variables and the amount of tempeh demand as independent variables with data collection techniques through documentation techniques.

3.2 Analytical Approaches

Classical assumption tests were carried out in this study, including normality tests, multicollinearity tests, autocorrelation tests, and heteroscedasticity tests. After the data passes the classical assumption test, statistical tests are then carried out, including the F test, t test, and determination test (R^2).

3.3. Operational Definition of Variables

3.3.1. Tempeh consumption
Tempeh consumption is the amount of tempeh consumption by the community in units of kg / capita / year.

3.3.2. Population
The total population is the total number of people legally residing in Indonesia.

3.3.3. Per capita income
Per capita income is the total income of a region divided by the population in one year.

3.3.4. Imported soybean prices
The price of imported soybeans is the price of soybeans imported from abroad or imported at the farmer level (producer prices).

3.3.5. Egg price
The price of eggs is the average price of eggs nationally.

4. Results

The results of this study present several parts, namely the results of classical assumption tests and statistical test results.

4.1 Tables Classical Assumption Test

Analysis on panel data using classical assumption tests of multicollinearity and heteroscedasticity (Basuki & Yuliadi, 2014) and (Napitupulu et al., 2018).

Table 1. Normality Test

Jarque-Bera	0.868620
Probability	0.647712

Based on the results of the normality test, the Jarque-Bera probability value obtained is 0.647712, so it can be said that the probability value of JB greater than α (alpha) is equal to 0.05. Thus, it explains that the error term in the model is statistically normally distributed.

Table 2. Multicollinearity Test
KT

KT	1.000000
JP	0.227716
PPP	-0.052467
HK	0.139289
HTL	0.198435

Based on the results of the multicollinearity test in the study, the correlation coefficient between the independent variables Number of Population (JP), Per Capita Income (PPP), Imported Soybean Price (HK), and Egg Price (HTL) was less than 0.85. Then it can be concluded that the model is free from the problem of multicollinearity.

Table 3. Autocorrelation Test

F-statistic	0.237558	Prob. F(2,9)	0.7933
Obs*R-squared	0.802297	Prob. Chi-Square(2)	0.6696

Based on the results of the autocorrelation test, it is known that the Probability Obs*R-Squared value is 0.6696 (>0.05), so it can be concluded that the model is free from autocorrelation problems.

Table 4. Heteroskedastisitas Test

F-statistic	3.993611	Prob. F(4,11)	0.0307
Obs*R-squared	9.475306	Prob. Chi-Square(4)	0.0503
Scaled explained SS	1.927081		

Based on the results of the heteroscedasticity test in this study, it is known that the Probability Obs*Squared value of 0.0503 (>0.05) can be concluded that there is no heteroscedasticity problem in the time-series data regression model.

4.2 Statistics Test

The statistical test in this study uses multiple linear regression analysis tools to analyze the impact of independent variables (amount of production, per capita income, imported soybean prices, and egg prices) on the dependent variable (tempeh demand). The results of this multiple linear regression are shown in tabular form as follows.

Table 3. Statistical Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-63.40798	28.08911	-2.257386	0.0453
JP	4.293227	1.684780	2.548243	0.0271
PPP	-0.048252	0.031075	-1.552756	0.1488
HK	-0.598485	0.269972	-2.216844	0.0486
HTL	-0.436069	0.442578	-0.985293	0.3457

R-squared	0.572230	F-statistic	3.678683
Adjusted R-squared	0.416677	Prob(F-statistic)	0.038853

Test F was conducted in this study with the aim of determining whether the independent variables (population, per capita income, imported soybean prices, and egg prices) together have a significant effect or not on tempeh demand. Based on the results of tests that have been carried out in Table 15. obtained F-statistic value of 3.678683 with Prob (F-statistic) value of 0.038853 (<0.05) then it can be concluded that independent variables (population, per capita income,

imported soybean prices, egg prices) have a significant effect simultaneously (together) on the dependent variable (tempeh demand).

A t-test was performed to find out whether each independent variable in the model had a significant influence on tempeh demand. The results of these tests are presented in table 15.
The results of this test can be described in the following explanation.

  a. The population variable (JP) has a t-Statistic value of 2.548243 with a value of Prob. (Significance) of 0.0271 (<0.05) it can be concluded that the variable population has a significant effect on tempeh demand. Then the initial hypothesis was accepted.
  b. The variable per capita income (PPP) has a t-Statistic value of -1.552756 with a value of Prob. (Significance) of 0.1488 (>0.05) it can be concluded that the variable per capita income does not have a significant effect on tempeh demand. Then the initial hypothesis was rejected.
  c. The variable price of imported soybeans (HK) has a t-Statistic value of -2.216844 with a value of Prob. (Significance) of 0.0486 (<0.05) it can be concluded that the variable price of imported soybeans has a significant effect on tempeh demand. Then the initial hypothesis was accepted.
  d. The variable egg price (HTL) has a t-Statistic value of -0.985293 with a value of Prob. (Significance) of 0.3457 (>0.05) it can be concluded that the variable price of eggs does not have a significant effect on tempeh demand. Then the initial hypothesis was rejected.

It is known that the Adjusted R-squared value of 0.416677 can be concluded that the contribution of the influence of independent variables (population, per capita income, imported soybean prices, egg prices) simultaneously (together) amounted to 41.6677 percent. While the remaining 58.3323 percent was influenced by other variables outside this research model.

5. Discussion

The results showed that the population had a positive and significant effect on tempeh demand. This result is in line with the initial hypothesis that population has a positive effect on tempeh demand. That is, an increase in population will lead to an increase in demand for tempeh. The results of this study are in line with research conducted by Sagala et al. (2020) &; Zakiah (2011), that population has a significant effect on soybean demand. This is because the increasing population will cause an increase in needs, including the need for tempeh as one of the foodstuffs. Moreover, the development of the food industry sector that uses tempeh as a processed basis makes the demand for tempeh continue to increase.

In compiling the initial hypothesis, it was assumed that the variable per capita income negatively affects tempeh demand. However, the results of this study reject this hypothesis because based on the t test, the variable per capita income has no effect and is not significant on tempeh demand. This result is also not in accordance with the results of research by Saputro & Fidayani (2020) which states that per capita income negatively affects tempeh demand.

The variable per capita income in this study does not affect the demand for tempeh because even though a person's income increases, it does not necessarily make someone to buy tempeh. He will prefer other foods that are of higher quality than tempeh. This can be seen in the Food Consumption Bulletin from the Ministry of Agriculture's Pusdatin (2022) which states that the demand for

tempeh does not always increase, unlike the per capita income of the population which always increases every year based on the Central Statistics Agency (2022). Someone with a high income is more likely to allocate their funds to the non-food sector.

The results of this test are supported by the results of research (Sahara &; Gunawati, 2005) which states that income does not have a significant effect on soybean demand and research by Nizar (2020) which states that per capita income does not directly affect average consumption. This is because people still have a tendency to allocate their income to be saved or spent in the non-food sector, even though marginal consumption expenditure (marginal propensity to consume) increases.

The results showed that the price of imported soybeans had a negative and significant effect on tempeh demand. This result is in line with the initial hypothesis that the price of imported soybeans negatively affects tempeh demand. That is, the increase in the price of imported soybeans will cause a decrease in demand for tempeh. The results of this study are in line with the opinion of Kotler et al. (2009) which states that price is one of the determinants of demand, meaning that the more expensive the price of a product tends to reduce consumer demand, the cheaper or more affordable the price of a product, the greater the demand. This opinion is supported by research by Bianridha et al. (2022) which states that the variable price of tempeh chips is negative for demand for tempeh chips, which means that if the price of imported soybeans increases which causes tempeh prices to increase as well, the amount of demand will decrease.

The results showed that the price of eggs did not have a significant effect on the demand for tempeh. This result means that the initial hypothesis that egg prices negatively affect tempeh demand was rejected. The results of this test are not in accordance with the theory (Gilarso, 2003) which states that substitute goods have a positive effect on the demand for the main goods. The variable price of eggs does not affect the demand for tempeh because when the price of eggs rises, it does not make someone immediately switch to buy tempeh which in fact is cheaper. He will prefer to keep buying eggs or other foods whose prices are not far apart, as in research. The results of this study are supported by research by Hanafi et al. (2014) which states that egg prices do not have a significant effect on tempeh demand.

6. Conclusion

Based on the results of the research that has been discussed, it can be concluded, among others: (1) Independent variables (population, per capita income, imported soybean prices, egg prices) have a significant effect simultaneously (together) on the dependent variable (tempeh demand). (2) The variable population (JP) has a positive and significant effect on tempeh demand, the variable price of imported soybeans (HK) has a negative and significant effect on tempeh demand, while the variable per capita income (PPP) and egg price (HTL) do not have a significant effect on tempeh demand in 2007-2022 in Indonesia.

Based on the conclusions discussed earlier, it can be conveyed that the implication of this study is to compensate for the need for tempeh, the Department of Agriculture and Food Security should hold a program to increase the production of imported soybeans intended to meet national soybean needs which tend to increase as a result of increasing population and community income, as well

as increasing public knowledge about the nutritional content of some food products made from soybeans. The program is expected to reduce dependence on soybean imports and can increase tempeh production which can ultimately increase domestic food security so that food self-sufficiency can be realized.

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