International Journal of Scientific Research and Management (IJSRM)
||Volume||12||Issue||11||Pages||7882-7894||2024||
Website: https://ijsrm.net ISSN: 2321-3418
DOI: 10.18535/ijsrm/v12i11.em07

Analysis of Determinants of Beef Production and Imports and Their Impact on Beef Consumption in Indonesia

Muhammad Saleh Mire, Rahcmad Budi Suharto

Faculty of Economics and Business, Mulawarman University, Indonesia

Abstract
This research aims to determine and examine the influence of DPB per capita, education, beef cattle and prices on beef production and consumption using secondary time series data for the period 2017-2022. There search method is quantitative by using analytical method of econometric model of path analysis. There search results show that beef cattle and GDP per capita have an influence on beef production and these two independent variables are inelastic to this production. However, the influence of GDP per capita does not have an impact on increasing beef consumption. Local beef prices have a positive influence on beef imports which are inelastic and have no effect on beef production. Furthermore, beef production has appositive effect on consumption, but has no effect on beef imports. Furthermore, imported beef has a negative influence on beef consumption, whereas beef is positively influenced by its production. Then the increase in education levels caused beef imports to increase significantly, but did not have an impact on beef consumption, then this increase in beef imports caused a real decrease in beef consumption. .

Keywords: GDP per capita, Education, Beef production, Price, Exchange rate, Beef consumptions
JEL Classification: E21, Q11, Q17.

1. Introduction

The increasing population of Indonesia and increasing public awareness of the importance of animal protein have caused consumption of animal protein, especially beef, to increase as well. Domestic people's need for meat will continue to increase along with the increase in population, increasing economic levels, public awareness of nutrition, and the presence of people abroad (Khasrad & Ningrat 2010). The total population in Indonesia as of January 31 2023 is 274 million people with a Muslim population reaching 237.55 million people, where it is known that Muslims do not eat pork, so beef is one of the commodities that can be consumed to meet nutritional needs for meat. Beef is a livestock product that is a source of high quality animal protein and is widely consumed by the public to fulfill the body's essential amino acids. Beef is a livestock product which is a source of protein. Animals are food that contains nutrients needed by the body for the healthy growth of body cells so that humans are healthy and can work productively. This can be achieved if people's income is adequate, because the measure of the success of economic development to date still uses per capita income of the population.

GDP US$ 118,503.6 per capita per capita income is a calculation of the income of the number of people in the country, where per capita income is the result of the country's national income. Per capita income in a country can increase if the average income of the country's population rises or is high. Indonesia has only reached per capita income of U$ 4,919, compared to Singapore which has reached US$ 84,714 and Malaysia Singapore: US$ 87.9 thousand. Brunei Darussalam: US$34.4 thousand. Malaysia: US$13 thousand. The increase in per capita income that can be achieved shows the success of development in the economic sector. Per capita income reflects people's purchasing power. Thus, if there is an increase in people's per capita income, people's purchasing power will increase, including their ability to spend on food such as beef. Apart from GDP per capita, education can also determine a country's food and food consumption, because a country's high level of education can determine choices in life, including food consumption.

Education Statistics and BPS data (2022) noted that 59.88% of Indonesia's population had completed primary education, while 29.97% of the population had secondary education, and only 6.61% had tertiary education. Indonesia is in 4th position in the list of countries in Southeast Asia with the best education system, while in Asia it is in 13th place (Simanungkalit, 2023). Education problems in Indonesia can be classified into 2 parts, macro problems include: Curriculum that is confusing and too complex, unequal education, placement and quality of teachers, expensive education costs; while from the micro scope it includes: monotonous learning methods, facilities and infrastructure that are less supportive and low student achievement (Kurniati, 2023). However, as efforts continue to be made to improve, Indonesia has demonstrated a commitment to improving the quality and accessibility of its education at all levels. A country's high level of education can encourage the choice to pay more attention to physical needs (in addition to spiritual needs) which can fulfill life's needs in the form of food and non-food. One of the non-food needs is beef so that the management and development of beef cattle can run according to expectations.

Cattle can basically be divided into two, namely beef cattle and dairy cattle. Beef cattle are raised for the main purpose of producing meat. The Central Statistics Agency (2023) stated that the beef cattle population in Indonesia for the last ten years, 2013-2022, showed positive growth, increasing by an average of 3.81% per year, despite fluctuations in the beef cattle population. The beef cattle population over the last five year period (2018-2022) grew more slowly with an average growth of 1.77% per year. Even though in 2013 there was a very significant decline, namely 20.62% because the data was generated based on the results of the 2013 Agricultural Census, in subsequent years there continued to be an increase. The population decreased in 2013, because that year there was an Agricultural Census, so the cattle population was the result of the Census, not based on population estimates using parameters. In 2023 there will also be an Agricultural Census activity, it is estimated that the beef cattle population will also be corrected again (Darmawan at. al., 2023). Furthermore, it is said that there are many derivative products from beef, especially processed products that are in great demand by the public, such as shredded beef, beef jerky, meatballs, sausages, corned beef, gaga and so on. This indicates that beef can be the main raw material for various food products. Total meat consumption is sourced from household consumption, medium-sized industries, micro-small industries, hotels, restaurants, restaurants and health services. Henceforth, in calculating national beef consumption, the equivalent consumption of beef sourced from basic necessities is used multiplied by the population (Center for Agricultural Data and Information Systems, 2023)

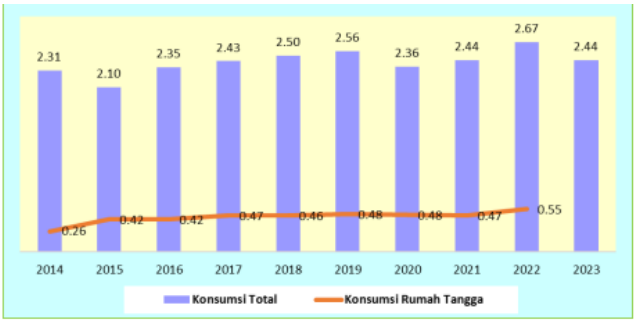


Figure 1. Development of Beef Consumption in Indonesia, 2014-2023
Source: Center for Agricultural Data and Information Systems, 2023.

Beef is one of the food commodities that has so far contributed to fulfilling people's nutrition, especially animal protein which is very important for Indonesian people in supporting the development of Indonesia's human resources (Food Security Agency, 2011; Tong, Y. and Darodjad, T.A., 2022). As population growth increases and the standard of living of the population in Indonesia improves, the demand for products to meet nutritional needs is also increasing, as is the demand for food such as animal protein. However, meat consumption in Indonesia is still far behind compared to Asian countries, such as Japan or Korea. In fact, Indonesia's meat consumption is said to be equivalent to Ethiopia's (Waluyo, 2023).

The development of beef equivalent consumption per capita in Indonesian society from 2014 to 2022 fluctuates but tends to increase by an average of 0.28% per year (Figure 2). In this period, the highest peak

consumption in 2022 increased by 9.43%, namely from 2.44 kg/cap/year in 2021 to 2.67 kg/cap/year in 2022. However, consumption also experienced a significant decline in 2020 amounted to 7.81%, namely from 2.56 kg/capita/year in 2019 to 2.36 kg/capita/year in 2020. This is the impact of the Covid-19 disease outbreak which occurred from March 2020 until the end of the year 2022 (Playwright, at. al., 2023). Over the last five years (2018-2022) household beef consumption increased 3.36% per year, or lower than the increase in total beef consumption. Household consumption of fresh beef in 2020 was 0.478 kg/capita/year, down 1.42% from 2019 of 0.485 kg/capita/year (Central Statistics Agency, 2023). The ratio of household consumption of beef compared to total consumption of equivalent meat is 19%, this means that meat cooked at home is only around 20%, the remaining 80% of meat is mostly consumed as processed meat or ready-to-eat meat. Beef consumption in 2023 will decline (Figure 1). This could be caused by people's purchasing power for meat consumption also decreasing.

Meat consumption in Indonesia is still considered low, especially when compared with world meat consumption. The OECD or Organization for Economic Cooperation and Development (2022) states that world meat consumption is an average of 6.3 kilograms per capita while the Central Statistics Agency (BPS, 2023) reports that per capita consumption of beef and buffalo in Indonesia in 2022 is estimated around 2.5 kilograms or 695,390 tons with a population of around 274 million people. Previously in 2021, the OECD also reported that meat consumption in Indonesia was still below the world average. Based on animal type, Indonesia's consumption of chicken meat will only be 8.1 kilograms (kg) per capita in 2021, while the world average consumes 14.9 kg per capita. Beef consumption in Indonesia is 2.2 kg per capita, while the world average is 6.4 kg per capita. In several regions there are differences in meat consumption, in the province of DKI Jakarta is the region with the highest consumption level, namely 6.10 kg per capita during a year. West Nusa Tenggara Province is in second place after DKI Jakarta with a consumption level of 4.06 kg per capita which includes kg per capita for a year. Furthermore, consumption of beef and buffalo in West Java and East Java is the same, namely 3.30 kg per capita for a year. The province with the lowest level of meat consumption is North Sumatra with 0.67 kilograms per capita. The low level of meat consumption in Indonesia is caused by two factors, namely price and supply. Economic law applies when demand and supply experience an imbalance (BPS, 2023).

Indonesia's beef consumption is only 2.66 kilograms (kg) per capita per year or below the world average of 6.4 kg per capita per year (Ministry of Agriculture, 2023). Consumption of this meat in Indonesia is much lower than beef production, so imports are needed. Indonesia's beef consumption in 2021 will be around 717,750 tons per year. However, domestic beef production is only 437,783 tons per year. To meet these needs, Indonesia imported 279.97 thousand tons of frozen meat. So there is an imbalance between supply and demand resulting in high beef prices in Indonesia. In Indonesia, beef is more widely consumed at certain times such as Eid al-Fitr or Eid al-Adha. One of the causes of low per capita beef consumption is the high price of beef, apart from that it is also caused by production. The high price of beef in Indonesia is due to the lack of supply of cattle for domestic needs as the number of cattle breeders in Indonesia continues to decline. This is because the welfare level of breeders is low so interest in becoming a breeder is low (Waluyo, D., 2023). Furthermore, according to data, the number of beef cattle farming businesses in 2013 was 5,078,979 households. However, in 2018 the number decreased to 4,642,186 households. Cattle breeders in Indonesia are smallholder farmers who on average only have between three and four cows (Livestock and Animal Health Statistics in 2023).

Beef cattle are the main livestock commodity which provides meat and the main source of animal protein, next to poultry. After successfully launching the Special Efforts program to Accelerate Increasing the Population of Pregnant Cows and Buffaloes, the Ministry of Agriculture through the Director General of Animal Husbandry and Animal Health (2023) is accelerating the fulfillment of people's needs for animal protein, namely meat and milk with the National Mainstay Commodity Cow and Buffalo program with the aim of increasing the cattle population , through this program it is hoped that the beef cattle population will grow more quickly and ultimately reduce dependence on feeder cattle and imported beef (Darmawan, R., 2023). Furthermore, it is said that beef cattle are the second commodity after broiler chickens in providing meat for consumption. In 2021 beef production will be 487.80 thousand tons, out of total meat production of 4,546.96 thousand tons or contributing up to 10.73% of national meat production, so in general to meet beef

needs, around 30% - 40% is still supplied by imported beef (Ministry of Agriculture, 2023). As an illustration of beef imports in Indonesia originating from various countries (Table 1):

Table 1. Imports of Cattle Meat by Country Primary Origin, 2018-2023

Country of origi	2018	2019	2020	2021	2022	2023
	Berat Bersih : Ton					
India	67750.9	80397.8	65961.3	84219.3	77515.6	104204.1
Australia	79634	93970	76365.4	84954.8	105756.3	112601
Brasil	5941.3	9978.8	10829.8	12903.9	13693.1	12303.2
United States	6406.6	7347.4	7433.4	9945.6	7414.8	6361.8
New Zealand	822.7	2080.7	2515.3	3355.7	1114.5	525.7
Spanih	11.7	13.5	15.4	131.6	35.6	48.3
Others	79.1	3558.7	4008	15918.7	20120.2	2389.5
Jumlah	160646.3	197346.9	167128.6	211429.6	225650.1	238433.6

ource: Central Statistics Agency (2023)

Furthermore, by comparing beef production and imports in Indonesia, it can be seen in Figure 2 that beef production in Indonesia tends to decline while imports tend to experience a high increase from 2014-2022. This causes beef imports and production to experience an ever-widening gap.
The total import volume in that period ranged from 183 thousand tons to 287 thousand tons, whereas the export volume only ranged from 24 to 70 tons. In contrast to the volume of imports which tends to continue to increase, and during this period the gap between the volume of exports and imports is getting wider, the peak occurs in 2021 and 2022 with a deficit reaching 276.69 thousand tons and 287.48 thousand tons. In 2022, the highest volume of beef imports will reach 287.53 thousand tons or the equivalent of US$ 1,056 million. This situation has an impact on the beef trade balance deficit being quite high, reaching US$ 1,056 million (Figure 2). In 2023, with conditions up to August, meat imports have reached 183.11 thousand tons with an import value of US$ 606.3 million. Furthermore, by comparing beef production and imports in Indonesia, it can be seen in Figure 2 that beef production in Indonesia tends to decline while imports tend to experience a high increase from 2014-2022. This causes beef imports and production to experience an ever-widening gap.

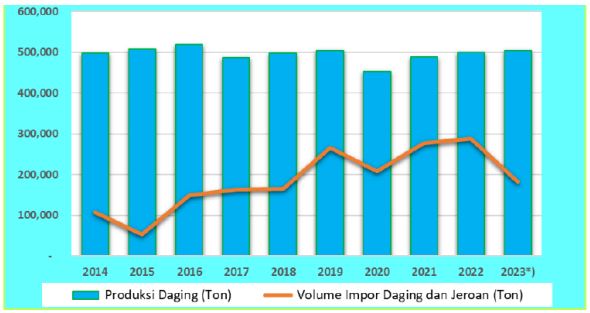
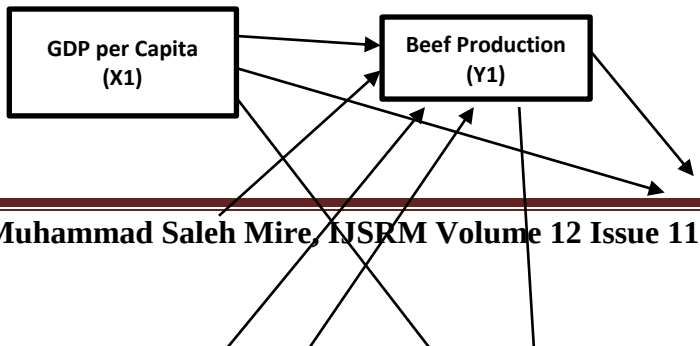


Figure 2. Development of Beef Production and Imports in Indonesia, 2014 – 2023
Source: Center for Agricultural Data and Information Systems, 2023

The description that has been presented previously can present the relationship between variables in this research where beef production can be determined directly by GDP per capita, education, beef cattle and beef price. Furthermore, this beef production together with the four variables mentioned can determine the amount of beef imports entering Indonesia so that it can have an impact on increasing beef consumption by the public. Then the amount of consumption can be determined directly by GDP per capita, education, beef cattle, meat prices (local), production and imports (Figure 3).



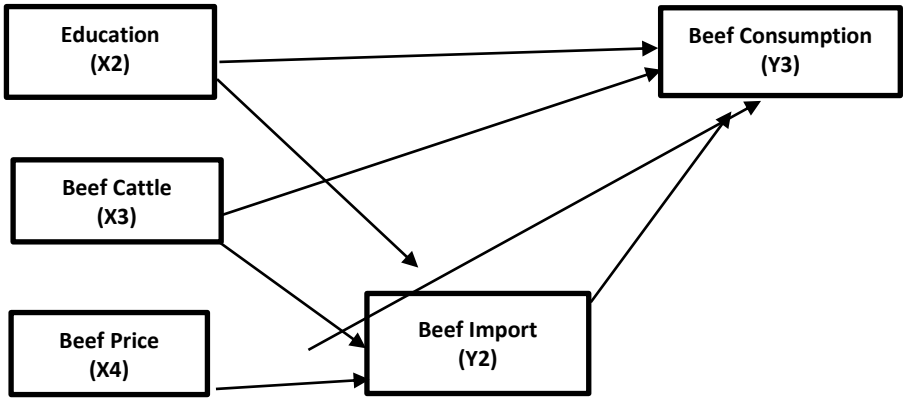


Figure 3. Framework

Basically, the aim of this research is to explain the determinants of domestic beef consumption so as to produce a recommendation that can become a policy for the government, so the aim of the research is

1. Examine the influence of GDP per capita, education, beef cattle and prices on beef production
2. Examining the influence of GDP per capita, education, beef cattle, prices and production on beef imports
3. Examining the influence of GDP per capita, education, beef cattle and prices, production and imports on beef consumption

2. Literature Review

2.1. Consumption and Consumer Behavior

According to Samuelson, consumption is the activity of spending the utility (use value) of goods and services. Goods include durable goods and non-durable goods. Consumer goods according to their needs, namely: primary needs, secondary needs and tertiary needs (Mankiw, G., 2000). Consumption is the essential goal of the product, because production is a means for consumption, and production is necessary as long as there is consumption, because consumption is the final part of production, thus production can stop but consumption cannot stop. Apart from that, consumption and savings depend on the income function, because consumption and income have a positive relationship, if a person's income increases, consumption will also increase. The rise and fall of consumption levels is expressed in marginal propensity to consume (MPC) or the desire to consum**e.**

Marginal Propensity to Consume from Keynes is a concept that gives an idea that consumption will increase if disposable income increases by one unit. According to (Todaro and Smith, 2007), if income increases then the level of consumption will also increase but the amount is smaller than the increase in income. The average propensity to consume (APC) is the ratio of consumption to income which will decrease when income increases. Rich people will set aside more of their income for saving than for consumption (Mankiw, 2000). Permanent Income Theory This permanent income theory (Permanent Income Hypothesis) was proposed by Milton Friedman. Permanent income theory believes that income is the dominant factor that influences consumption levels. What is meant by permanent income is the average level of income expected in the long term. The source of income can come from salary/wages and non-salary/non-wages. The relative income theory (Relative Income Hypothesis) was developed by James Duessenberry. Although this theory recognizes the dominant influence of income on consumption, this theory pays more attention to the psychological aspects of households in facing changes in income (Branson, 2005).

If an individual's income level is higher, consumption will also increase proportionally to the increase in income. Meanwhile, if income levels decrease, consumption levels will not decrease proportionally following long-term consumption, but will follow short-term functions. The Relationship between Income and Consumption One important variable that can influence household (micro) and country (macro) consumption levels is income. Income is an important factor that influences consumption behavior. Income

can describe a person's ability to consume both in terms of quality and quantity. A person's ability to meet food and non-food needs will increase if the income earned is greater, and vice versa

Keynes's consumption function whose main variable is absolute national income is contrasted with relative income, permanent income, short-term income and long-term income and the life cycle. Absolute income is the independent variable of the expressed Keynesian function

$C = C_0 + C_1 Yd$,

This function shows a linear function, in fact for Keynes it is not linear or the graph is curved (not straight). This consequence makes the MPC decrease if National Income increases. Furthermore, if national income increases, APC decreases and MPC < APC. Another function of the consumption function is the consumption function with the life cycle hypothesis put forward by A. Ando, R. Brumberg and F. Modigliani (Branson, 1989) which tries to describe society's consumption patterns based on income and expenditure patterns which are influenced by time. The results of this analysis show that the consumption function is a straight line passing through the zero point, in accordance with the long-term consumption function as proposed by Kuznets. Furthermore, the relative income hypothesis from James Duesenberry states that a society's consumption expenditure is mainly determined by the highest level of income it has ever achieved. If income decreases, consumption will not decrease much. To maintain the level of consumption, the amount of savings is reduced. If income increases, consumption will also increase, but it will not be the same as the original increase, until it returns to the level of income that influenced the original consumption.

Household consumption is the amount of consumption expenditure in order to meet daily living needs, where the amount of consumption also increases welfare. The consumption in question is food and non-food consumption. Food consumption in question is all basic needs or food requirements consisting of rice, sugar, cooking oil, eggs, milk, meat, coffee. Non-food consumption consists of health, education, telephone, water and the need for other goods and services and is calculated in rupiah per month (Central Statistics Agency, 2023).

2.2. Production

Production, which can be expressed as a function of input in the form of capital and labor, is an activity carried out to convert input into output or can be understood as an activity to add value to a good or service by involving production factors as input. According to (Moss, 2012) the production function is a technical relationship depicting the technical transformation of inputs into outputs. So production is a link in the chain of economic activities so it is very important for the survival of society. The relationship between the amount of input and output within a certain period of time is called the production factor with the final goal being consumption. Production concerns producer behavior that can maximize profits from production results by using a combination of production factors and efficient production functions.

The relationship between input and output in the production process can be written as a functional relationship: $Q = f(X1, X2, X3, \dots, Xn)$. In this equation, Q represents the output or amount of production in a certain period, and X represents the production factors or inputs in the production process.

One function that is often used in the production process is the Cobb-Douglas function with a basic formula (can be developed into several independent variables):

$$Q = AK^{\alpha} L^{\beta}, \ \alpha + \beta = 1$$

Where:
A= Technology or efficiency
Q = amount of production/output
L = number of workers
K = amount of capital.
The values of α and β in the Cobb Douglas equation respectively indicate the elasticity of the input factors of L and K. In the Cobb Douglas function equation the sum of the elasticities of the input factors can indicate the additional level of results with the following conditions: if $\alpha + \beta = 1$ there is an additional result that constant over production scale, (Constant return to scale); If $\alpha + \beta > 1$ there are additional returns that increase on the scale of production, (Increasing return to scale) and if $\alpha + \beta < 1$ there are additional returns that decrease on the scale of production, (Decreasing return to scale).

ne of the advantages of the Cobb-Douglas function is that the power of the function is elasticity which can be seen as (Mire, 2024).

$$Q = AK^{\alpha}L^{\beta}$$

$$\frac{\partial Q}{\partial K} = A\alpha K^{\alpha-1}L^{\beta} \text{ atau } \frac{\partial Q}{\partial K} = A\alpha \frac{K^{\alpha}}{K}L^{\beta} \quad \text{atau} \quad \frac{\partial Q}{\partial K} = \alpha \frac{Q}{K} \text{ sehingga } \alpha = \frac{\partial Q}{\partial K}\frac{Q}{K}.$$

For input L or labor, it can be done using the same process.

The relationship between consumption and production is very close, because the results or production output for consumers are obtained through buying and selling transactions. In general, consumption economics deals primarily with the utility maximization problem, whereas production economics is concerned primarily with the profit maximization problem (Debertin, 2012)

2.3. Import

Import is an activity or type of international trade. Foreign trade is trade carried out by residents between countries that are limited by mutually agreed regulations so as to give birth to export and import activities (Todaro and Smith 2020). Imported goods are all types of goods that are registered as imported goods and comply with applicable tax and customs provisions. Adam Smith argued that economic growth could be achieved by specializing in the production of goods and services. Specialization can occur if there is a large market to accommodate production results, this market exists if a country carries out international trade. Furthermore, according to Andi Susilo (2013) stated that "Import can be defined as the activity of bringing goods from one country (overseas) into the customs territory of another country. "This means involving 2 countries - in this case the interests of the 2 companies between the two countries can be represented which are different and of course also have different regulations and legislation."

According to Law no. 17 of 2006 as a replacement for Law no. 10 of 1995 concerning Customs, import is defined as the activity of entering goods into Customs. Import is defined as the activity of entering goods into the customs area (article 1 paragraph (13) of Law No. 17 of 2006 concerning Customs). In Law no. 17 of 2006 provides juridical confirmation, namely, when goods enter the customs area and determines when the goods become payable for import duty and is a juridical basis for customs and entry officials to carry out supervision (explanation of article 2 paragraph (1) of Law No. 17 of 2006 concerning Customs). According to Widodo T. and Subagya, (2024) the benefits obtained from imports from a country, imports will be able to encourage economic growth and can have positive and negative impacts on a country's economy. The positive impact is that the availability of consumption and supplies of goods with imports means consumers will have more choices and allow consumers to get competitive prices. Apart from that, imports will have a positive impact on the development of domestic industry, especially those related to industrial raw materials. However, imports also have a negative impact on state finances, because imports mean wasting foreign exchange. So the main benefit of imports is the availability of finished and semi-finished goods and also domestic industrial raw materials which can encourage economic growth, while the negative impact is that it can drain a country's foreign exchange. So to avoid this kind of negative impact is to import for export.

3. The Method

This type of research is quantitative, taking the type of study of comparative causality that processes numerical data that can be calculated using statistical formulas. The data analysis technique used in this study is path analysis which estimates the direct and indirect influence of exogenous variables on endogenous variables although in this study we only look at and discuss the direct effect, both effects are available in the statistical program used for estimation in this study.

This study uses secondary data, namely data that is already available and collected by other parties and it was panel data. The data was taken from the Indonesia Central Statistics Agency (BPS) and the Agricultural Partnership of the Republic of Indonesia which covers 34 provinces in Indonesia. In Indonesia there are 38 provinces, but these four regions are new provinces, so only 34 provinces are eligible for data analysis. The statistical analysis technique used is path analysis using the Amos 18 statistical application program.

Based on the conceptual relationship in the framework of thinking, mathematically functional relationships can be written as

Based on the conceptual relationship in the framework of thinking, mathematically functional relationships can be written as

$Y_1 = f(X_1, X_2, X_3, X_4)$ …..(3.1)
$Y_2 = f(X_1, X_2, X_3, X_4, Y_1)$ …..(3.2)
$Y_3 = f(X_1, X_2, X_3, X_4, Y_1, Y_2)$…..(3.3) ……(3.3)
whereas:
X_1= GDP per Capita (ratio of national income to population, IDR)
X_2 = education (average number of years spent by people aged 15 years and over studying)
X_3 = beef cattle (number of beef cattle, tails)
X_4 = beef price (Local price expressed in IDR)
Y_1 = beef production (amount of beef production)
Y_2 = beef import (amount of beef imports, tons)
Y_3 = beef consumption (Amount of beef consumption per year, IDR)

$$Y_1 = \alpha_0 X_1^{\alpha 1} X_2^{\alpha 2} X_3^{\alpha 3} X_4^{\alpha 4} e^{\mu 1} \quad \text{.....(3.4)}$$

Or in linear form

$$\ln Y_1 = \ln \alpha_0 + \alpha_1 \ln X_1 + \alpha_2 \ln X_2 + \alpha_3 \ln X_3 + \alpha_4 \ln X_4 + \mu_1 \quad \text{.....(3.5)}$$

$$Y_2 = \beta_0 X_1^{\beta 1} X_2^{\beta 2} X_3^{\beta 3} X_4^{\beta 4} Y_1^{\beta 5} e^{\mu 2} \quad \text{.....(3.6)}$$

atau

$$\ln Y_2 = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln Y_1 + \mu_2 \quad \text{.....(3.7)}$$

$$Y_3 = \delta_0 X_1^{\delta 1} X_2^{\delta 2} X_3^{\delta 3} X_4^{\delta 4} Y_1^{\delta 5} Y_2^{\delta 6} e^{\mu 3} \quad \text{.....(3.8)}$$

atau

$$\ln Y_3 = \ln \delta_0 + \delta_1 \ln X_1 + \delta_2 \ln X_2 + \delta_3 \ln X_3 + \delta_4 \ln X_4 + \delta_5 \ln Y_1 + \delta_6 \ln Y_2 + \mu_3 \quad \text{……..(3.9)}$$

Equations 3.4 to 3.9 show that the model used in parameter estimation is the Cobb Douglass function. This function is linearized so that the coefficient shows the elasticity of an input to the output.

4. Results and Discussions

4.1. Model fit test

Chi-square statistics, as stated earlier, is the most fundamental test to measure overall fit, it is very sensitive to the size of the sample used and the relationship of exogenous variables, almost the same as the Multiple Linear Regression model. The model is considered good if the Chi-square value is small. The smaller the value, the more feasible the research, meaning that the more it describes the match between the variance of the sample taken and the research population. The results of data processing that have been carried out using the AMOS 18 program are as shown in Table 1.

Tabel 2. Goodness of Fit Index

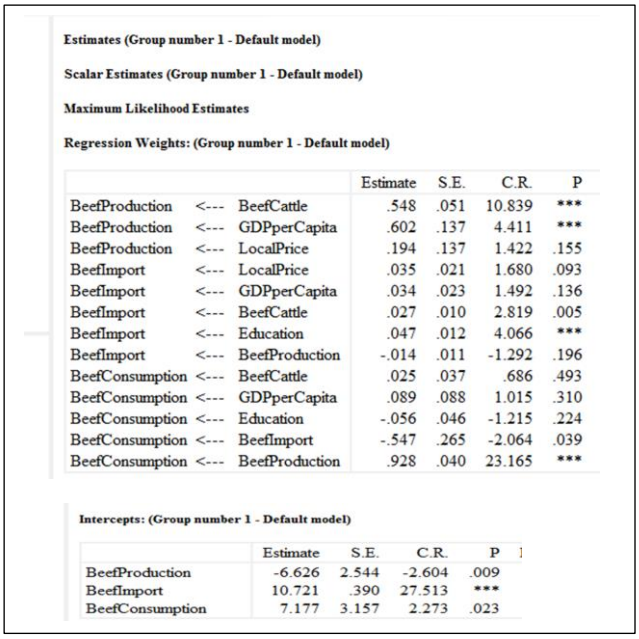
No.	Goodness of fit Measure	Cut-off Criteria	Estimation (cut off Value)	Fit Situation
1	Chi-Square (χ^2) Significance Probability	smaller the better	5.877	Fit

	(p)	≥ 0.05	0.209	
2	RMSEA (the Root Mean Square Error of Approximation)	≤ 0.05	0.048	Fit
3	NFI (Normed of Fit Index)	≥ 0.95	0.990	Fit
4	IFI (Incremental Fit Indices)	≥ 0.95	0.997	Fit
`5	CMIN/DF (the minimum Sample Discrepancy Function)	≤ 2	1.469	Fit
6	TLI (Tuckler Lewis Index)	≥ 0,95	0.983	Fit
7	CFI (Comparative Fit Index)	≥ 0,95	0.997	Fit
8	Hoelter's Index	≥ 200	328	Fit

Sumber: Malkanthie, 2015; Wan, 2022 and Amos Result

4.2. Research findings

In accordance with the proposed framework (Figure 3), which shows the existence of a relationship (both direct and indirect), data processing in this study uses the Amos program package, so that estimation results are obtained (Figure 5).



Estimates (Group number 1 - Default model)

Scalar Estimates (Group number 1 - Default model)

Maximum Likelihood Estimates

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P
BeefProduction	<---	BeefCattle	.548	.051	10.839	***
BeefProduction	<---	GDPperCapita	.602	.137	4.411	***
BeefProduction	<---	LocalPrice	.194	.137	1.422	.155
BeefImport	<---	LocalPrice	.035	.021	1.680	.093
BeefImport	<---	GDPperCapita	.034	.023	1.492	.136
BeefImport	<---	BeefCattle	.027	.010	2.819	.005
BeefImport	<---	Education	.047	.012	4.066	***
BeefImport	<---	BeefProduction	-.014	.011	-1.292	.196
BeefConsumption	<---	BeefCattle	.025	.037	.686	.493
BeefConsumption	<---	GDPperCapita	.089	.088	1.015	.310
BeefConsumption	<---	Education	-.056	.046	-1.215	.224
BeefConsumption	<---	BeefImport	-.547	.265	-2.064	.039
BeefConsumption	<---	BeefProduction	.928	.040	23.165	***

Intercepts: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P
BeefProduction	-6.626	2.544	-2.604	.009
BeefImport	10.721	.390	27.513	***
BeefConsumption	7.177	3.157	2.273	.023

Figure 5. Intercept, Elasticity and Probability (P) of Regression Weight.
Resource: Amos 18 Data Processing Results.

Paying attention to the results of data processing (Figure 5), it turns out that to get a good model, education cannot be included as one of the four variables that influence beef production. Thus there are only 3 variables that influence production (contrary to Figure 3) so that regression equations can be formed (the bottom part of the equation shows the probability or significant level)

$$\ln Y_1 = -6.626 + 0{,}602 \ln X_1 + 0{,}548 \ln X_3 + 0{,}194 \ln X_4 \ldots\ldots (4.1)$$

prob. 0,009 0.000 0.000 0.155

$$\ln Y_2 = 10.721 + 0.034 \ln X_1 + 0.047 \ln X_2 + 0.027 \ln X_3 + 0{,}035 \ln X_4 - 0.041 \ln Y_1 \quad \ldots\ldots (4.2)$$

prob. 0,000 0.136 0.000 0.005 0.093 0.196

$$\ln Y_3 = 7.177 + 0.089\ln X_1 - 0.056\ln X_2 + 0.025\ln X_3 + 0.928\ln Y_1 - 0.547\ln Y_2 \ldots\ldots (4.3)$$

prob. 0,023 0.000 0.224 0.493 0.000 0.039

Based on equations (4.1), (4.2) and (4.3), it is known that beef cattle have a positive effect on beef production in Indonesia. This effect is at the confidence level α= 0.01. The elasticity relationship between the two variables is inelastic, meaning that the percentage change in production is smaller than the percentage change in beef cattle or in other words, if beef cattle increases by 1% then production will also increase by 0.54%. This finding is in accordance with the results of research conducted by (Mukson, W. and Setiyawan. H., 2014) which states that an increase in the population of one livestock unit will encourage an increase in meat production by 8,187 units, and an increase in slaughtering capacity at the Slaughterhouse will be able to increasing meat production by 37,134.627 kg of meat/year. Furthermore, it was also discovered that the results of this study showed that an increase in beef production was followed by an increase in beef consumption. Statistically this positive influence is significant at the confidence level α=0.05. The magnitude of this elasticity is 0.93, meaning that if production increases by one percent, consumption will increase by 0.93%. This is of course supported mainly by the consumption theory of various experts, especially Keynes.

Based on these three equations, it is known that GDP per capita has a very significant positive influence at α= 0.01 on beef production. An increase in GDP per capita by one percent will result in an increase in beef production of 0.60% where the elasticity is inelastic. Furthermore, in the same table it is also known that GDP per capita has an insignificant positive influence on beef imports and beef consumption at the confidence level α= 0.05. GDP per capita does not provide beef consumption because beef is a consumer good that is difficult for people in general to access, especially those with low incomes, especially since beef can be substituted by other meats such as goat meat and even chicken meat. This fact is not in line with research findings conducted by (Kusumaningrum, R. and Suryana, A.T., 2021) which states that income has an influence on demand for beef in Indonesia, demand is usually aimed at macroeconomics and consumption is for macroeconomics, the clear tray is consumption have a positive relationship. The higher the consumption, the higher the demand. However, this is contrary to research conducted by (Salsabila and Setyowati 2023) which states that GDP has a significant influence on beef imports both from Austria and from the United States and India. This fact is actually appropriate because the research from these two people used the independent variable, namely GDP, while this research uses GDP per capita, so it is natural that it is contradictory.

Price is a determining factor in the demand or supply of an item. Based on equation (4.2) and equation (4.3), it is known that the results of the analysis show that (local) prices do not have a significant influence on beef production at the confidence level α= 0.05. This is in accordance with research which states that price is not the main determinant in beef production, but the main determining variable is transport costs (Bach, at al., 2024). This research shows that the price factor (local) does not have a significant influence on beef production at the confidence level α=0.05. This is closely related to the ability of the population to consume the limited cattle trade due to the limited budget to cover the daily needs of the lower middle class, which means that provision or supply is also not significantly influenced by prices. Furthermore, prices have a positive influence on beef imports with a confidence level of α=0.10, indicating that an increase in prices causes increases in beef imports. It can be said that the high price of beef will encourage people to consume imported beef for consumption. Apart from prices and per capita income, research also analyzes the relationship between education and beef imports and consumption.

Education has a real positive influence on beef imports at a confidence level of α=0.05 with a regression coefficient elasticity of 0.047. This shows that a 1% increase in education will have an influence on increasing beef imports in Indonesia. Increasing education will increase national income, this is in accordance with the importance of investment in human resources which will encourage economic growth (endogenous growth pioneered by Paul M Romer in 1986 and Robert Lucas in 1988 as a criticism of neo-classical growth theory). Furthermore, causally it will cause beef imports to increase as well, because increasing income can encourage demand for a good.

Different and even contradictory regarding consumption, where the estimation results show that education has no influence on beef consumption at the α=0.05 confidence level. This fact cannot be separated from the condition of public education which is still low when compared to other countries such as Malaysia and Singapore (Fauzie, 2018), so that people's per capita income is also low, so that beef consumption is low on average. It is known that income inequality as measured by the Gini Ratio tends to increase (Chayyani, 2021), income is mostly enjoyed by certain income groups, especially those from families with high incomes, while low and middle income groups do not even consume beef in a year except when certain days and events such as sacrificial holidays and other major holidays.

Furthermore, beef imports are a common practice in Indonesia considering that supplies are not sufficient for people's needs or demand. The research results show that the increase in beef imports causes a decrease in consumption of this meat. The negative relationship between beef consumption and imports is significant at the confidence level α=0.05. This fact could occur if domestic beef production is so low that it requires imports that exceed the demand or needs of the community which has an impact on reducing beef consumption, apart from that beef can be substituted by other meat (because the price is higher) as has been said. mentioned. So the results of the analysis show that the need for imported beef is reduced so that domestic production can increase and it is hoped that there will be beef self-sufficiency in Indonesia.

Beef consumption, as has been described, shows a marked increase from year to year, but production shows a downward trend, resulting in excess demand, where this excess is always overcome by imports, thereby draining the country's foreign exchange.

5. Conclusion and Recommendation

5.1. Conclusion

Based on the analysis and the results of the previous discussion, the following conclusions are drawn:

1. The research results show that the number of beef cattle and GDP per capita have an influence on beef production and both are inelastic to this production. However, the influence of GDP per capita does not have an impact on increasing beef consumption
2. Local beef prices have a positive influence on beef imports with inelastic properties and have no effect on beef production
3. Imported beef has a negative influence on beef consumption, whereas beef is positively influenced by its production.
4. Education has a positive effect on beef imports, but has no effect on beef consumption
5. Beef production has a positive effect on consumption, but has no effect on beef imports. Furthermore, the increase in beef imports was accompanied by an increase in beef consumption.

5.2.Recommendations

The suggestions to be put forward based on the discussion and conclusions that have been stated, among others:

1. Per capita income always increases every year, so the government should encourage an increase in per capita beef consumption by providing production factor facilities so that domestic beef production can increase and strive to become self-sufficient.
2. The government should try to reduce beef imports and encourage continuous fulfillment of domestic consumption needs, efforts to raise beef cattle so that it can save foreign exchange
3. However, education and training must be developed continuously, even though they have a positive influence on beef imports, they do not significantly affect beef consumption.
4. The research results show that beef imports have a negative influence on consumption, so it is hoped that the government will try as much as possible to reduce imports by launching a meat self-sufficiency program, especially beef

References

1. Central Bureau of Statistics. (2022)&(2023). Statistical Yearbook of Indonesia, Jakarta
2. Central Bureau of Statistics. (2023), Animal Husbandry in Numbers. Directorate of Livestock, Fisheries and Forestry Statistics, Volume 8. Jakarta

3. Buch, H.S. Zyl, J. & Vink, N. (1992). Empirical Information on Beef Production in Regions of Namibia as an Aid to Restructuring the Livestock Farming Industry along Equitable Lines. Development Southern Africa, 9(4), 423-432.
4. Branson, William, H. (1989) Macroeconomics: Theory and Policy. Happer & Row Publishers, Third Edition. Singapore.
5. Branson, William, H. (2005) Macroeconomics: Theory and Policy. Affiliated East-West Press Pvt. Ltd; 3rd edition (January 1, 2005).
6. Chayyani, N. R. (2022). Income Inequality and National Economic Recovery. Indonesia Report 2021. The Indonesia Institute, Center for Public Policy Research. Jakarta.
7. Darmawan, R., Susanti, Anna A., Putra, Rendy K., & Chafid, M. (2023). Beef Commodity Outlook. Book, ISSN : 1907-1507. Center for Agricultural Data and Information Systems, Secretariat General - Ministry of Agriculture.
8. Debertin, David L. (2012). Agricultural Production Economics. Second Edition, Library of Congress Cataloging in Publication Data. Retrieved from https://www.uky.edu/~deberti/prod/agprod5.pdf
9. Fauzie Y. Y. (2018). The quality of Indonesian education is still low. World Bank. Retrieved from https://www.cnnindonesia.com/gaya-live/20180607113429-284-304214/bank-dunia-kualitas-pendidikan-indonesia-masih-rendah.
10. Kementerian Pertanian, (2013). Livestock and Animal Health. Direktorat Jenderal Peternakan dan Kesehatan Hewan. Jakarta
11. Khasrad, Ningrat RWS. 2010. Improving carcass quality of indigenous cattle of West Sumatera fed local feed resources. Pakistan Journal of Nutrition. *9*(8): 822-826.
12. Kurniati, Fitria N. A. (2023). Meninjau Permasalahan Rendahnya Kualitas Pendidikan di Indonesia dan Solusi. Academy of Education Journal, *13*(1),1-13.
13. Kusumaningrum, R. and Anggita Tresliyana Suryana & Hanoum, Farah. C. (2021). The Effect of Changes in Beef Prices on Beef Supply and Demand in Indonesia. Enrichment: Journal of Manjement, *12*(1), 374-385.
14. Mankiw, Gregory. (2000). Macroeconomics. Worth Published, Harvard University. Ninth Edition. AMacmillan Education Imprint. New York
15. Malkanthie, Asoka. 2015. Structural Equation Modeling with AMOS Book. March 2015DOI: 10.13140/RG.2.1.1960.4647
16. Mire, Muhammad S. (2024). Identification of Agricultural Socioeconomic Factor and its Relationship with Exports of Palm and Palm Kernel Oils in Indonesia. International Journal For Multidisciplinary Research, Futuristic Research Publication, *6*(6), 1-18
17. Moss, Charles B. (1912). Production Economics: An Empirical Approach. Food and Resource Economics Department University of Florida. Retrieved from https://phdeconomicsgcuf.wordpress.com/wp-content/uploads/2016/10/production-economics-charlus-b-mos.pdf
18. Mukson, W. & Setiyawan. H. (2014). Analysis Development Regional of Cattle Beef in Support Meat Self-Sufficiency in Central Java. Jurnal Peternakan Indonesia, *16* (1), 26-32.
19. Organization for Economic Co-operation and Development (OECD). (2022). Economic Outlook, Confronting the Crisis, Volume 2022 (2).
20. Salsabila, Rista, I., & Setyowati, E. (2023). The Effect of Domestic Product and Exchange Rate on the Volume of Beef Import from Australia, India and United Stated in Indonesia from 2013- 2022). Jurnal Ekonomi, *12* (04), 2245-2251.
21. Simanungkalit, Kaleb E. (2023). Posisi Indonesia dalam Deretan Negara di Asia Tenggara dengan Sistem Pendidikan Terbaik. Kompasiana. Retrieved from https://www.kompasiana.com/kalebsikalit4437/65de2058c57afb2e6f369ad2/posisi-indonesia-dalam-deretan-negara-di-asia-tenggara-dengan-sistem-pendidikan-terbaik?page=all#section1.
22. Todaro, Michael P. & Smith, Stephen C. (2020). Economic Development. Pearson Education Limited, Thirteenth edition. Retrieved from https://students.aiu.edu/submissions/profiles/resources/onlineBook/F5v9e6_Economic%20Development-2020.pdf

23. Tong, Y. and Darodjad, T.A. (2022). Analysis on the impact of Beef Price Fluctuation on Consumer's Purchasing in Hulunbuir-China. Intention European Journal of Research Development and Sustainability (EJRDS), *3*(2), 53-59.
24. Waluyo, D. (2023). Jalan Menuju Swasembada Daging. Portal Informasi Indonesia. Retrieved from https://indonesia.go.id/kategori/editorial/7317/jalan-menuju-swasembada-daging-sapi?lang=1
25. Wan, T. T. H. (2002). Evidence-based health care management: Multivariate modeling approaches (1st ed.). Norwell, MA: Kluwer Academic Publishers.
26. Widodo, T. dan Subagya, (2024).. Apa dampak impor terhadap perekonomian Indonesia? Custom Trade Academy. Retrieved from https://customstradeacademy.id/cta/produk-impor-yang-sering-masuk-ke-negara-indonesia/