III. THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1. Theoretical Framework

This research is based on the analysis of demand and supply of beef. This is important because currently the demand of beef in the country is not met by the domestic supply. Therefore it is important to understand the behaviour of demand and supply of beef, that is, the factors that influence demand and supply of beef in the country as well as how demand and supply function in the market system theoretically or based on empirical studies.

3.1.1. Beef Production and Supply Function

Production function is a function that shows technical relationship between factors of production and output. It indicates the highest output that can be produced for every specified combination of inputs. Production function is also identified as supply function. Supply function can be derived from profit maximization of a firm through two conditions, that is, (1) first order condition where profit function will be maximized if first derivative of the function is equal to zero meaning that marginal product value of each input equals its price; (2) second order condition is fulfilled if the second derivative from function is less than zero or if Hessian Determinant is greater than zero (Henderson and Quandt, 1980).

Production function can show technology that is used by a firm, industry or the whole economy. The general production function at any level of technology is as follows:

\[ Q = f(X_i) \]
where:

\[ Q = \text{Total Output Produced} \]
\[ X_i = \text{Factors of Production} \quad (i = 1, 2, 3... n) \]

For this research, beef production function for beef farmer can be formulated as follows:

\[ Q = f (BC, AF, O) \] .......................................................... 3.2

where:

- \( Q \): Total Beef Production
- \( BC \): Total Number of Beef Cattle
- \( AF \): Total Animal Feeds
- \( O \): Other Production Factors

If the prices of factors of production are known, then production cost function can be formulated as follows:

\[ C = \sum_{i=1}^{n} (X_i V_i) + K \] .................................................... 3.3

where:

- \( C \): Total Cost
- \( V_i \): Price of Each Factor of Production
- \( X_i \): Each Factor of Production Used
- \( K \): Total Fixed Costs

For this research the production cost function for a beef farmer is as follows:

\[ C = P_{BC}^{*}BC + P_{AF}^{*}AF + P_{O}^{*}O + C_{F}^{*} \] ..................................................... 3.4

where:

- \( C \): Total Cost
- \( P_{BC} \): Beef Cow Price
- \( P_{AF} \): Animal Feeds Price
- \( P_{O} \): Price of Other Factors
- \( C_{F} \): Fixed Costs

Profit is defined as the difference between total revenue and total cost.

From equation (3.3) and (3.4) profit function can be formulated as follows:

\[ \pi = TR - TC = PQ - (\sum_{i=1}^{n} (X_i V_i) + K) \] .................................................... 3.5
\[ \pi = P^B \cdot q(BC, AF, O) - (P_{BC}^B \cdot BC + P_{AF}^B \cdot AF + P_{O}^B \cdot O + C^F) \] .................3.6

where:

\[ \pi = \text{Profit} \]
\[ P = \text{Price of Output} \]
\[ P^B = \text{Beef Price} \]

If the beef farmer is assumed to be rational, she will produce at the level which will give maximum profit. To maximize profit, the farmer will select the output for which the difference between revenue and cost is greatest. Profit function will be maximized if the first derivative of the function is equal to zero and second derivative is less than zero, then:

\[ \frac{\partial \pi}{\partial BC} = P^B \cdot BC' - P_{BC}^B = 0 \quad \text{or} \quad P^B \cdot BC' = P_{BC}^B \] ..................3.7

\[ \frac{\partial \pi}{\partial AF} = P^B \cdot AF' - P_{AF}^B = 0 \quad \text{or} \quad P^B \cdot AF' = P_{AF}^B \] ..................3.8

\[ \frac{\partial \pi}{\partial O} = P^B \cdot O' - P_{O}^B = 0 \quad \text{or} \quad P^B \cdot O' = P_{O}^B \] ..................3.9

where BC’, AF’ and O’ are marginal physical product of BC, AF and O. Thus, based on the first order condition, beef farmer’s profit will be maximized when marginal product value of each factor, which is marginal physical product of each factor multiplied by price of output, is equal to the price of each factor. Functions (3.7), (3.8) and (3.9) can be written as follows:

\[ BC' = \frac{P^B}{P_{BC}^B} \] ..................................................3.10

\[ AF' = \frac{P^B}{P_{AF}^B} \] ..................................................3.11

\[ O' = \frac{P^B}{P_{O}^B} \] ..................................................3.12

In other words, maximum profit of a beef farmer from beef production can be reached when marginal physical product of each factor of production is the same ratio of beef price to price of input. Factors of production (BC, AF, O) constitute endogenous variables while beef price and inputs prices \( P_{BC}^B, P_{AF}^B, P_{O}^B \)
constitute exogenous variables. Thus, factor demand function can be formulated as follows:

\[
BC^D = f(P^B, P^{BC}, P^{AF}, P^O) \quad ................................. 3.13
\]

\[
AF^D = f(P^B, P^{BC}, P^{AF}, P^O) \quad ................................. 3.14
\]

\[
Q = f(P^B, P^{BC}, P^{AF}, P^O) \quad ................................. 3.15
\]

where \(BC^D\), \(AF^D\) and \(Q\), each constitute demand for beef cattle, animal feeds and other factors of production, respectively. By substituting factor demand functions (3.13), (3.14) and (3.15) into production function (3.2), then beef supply function \(Q\) on a particular year can be formulated as follows:

\[
Q = f(P^B, P^{BC}, P^{AF}, P^O) \quad ................................. 3.16
\]

Equation (3.16) implies that total beef supply function is determined by beef price, beef cow price, animal feeds price and price of other production factors while other factors are assumed constant.

3.1.2. Beef Demand Function

Consumer demand for beef is determined by consumer utility function and available consumer income. A consumer is at equilibrium condition when her income has been allocated for purchases of goods that yield maximum utility. As a final product, beef demand function is derived from maximization of consumer utility function with income constraint (Henderson and Quandt, 1980). Therefore consumer utility function is as follows:

\[
J_B = f(Q_B, Q_G) \quad ................................. 3.17
\]

where

\[
J_B = \text{Total Utility from Beef Consumption}
\]

\[
Q_B = \text{Total Beef Consumption}
\]
If beef price is $P_B$ and price of other goods is $P_G$ then allocation of available consumer income ($Y^0$) for these two types of goods (ignoring savings) is as follows:

$$Y^0 = P_B \cdot Q_B + P_G \cdot Q_G$$ .............................................. 3.18

Rational consumer will try to maximize total beef and consumption of other goods in such a way that utility will be maximised with available income. Thus, maximum utility function with income constraint is:

$$V = f(Q_B, Q_G) + \lambda (Y^0 - P_B \cdot Q_B - P_G \cdot Q_G)$$ .............................................. 3.19

where $V$ is Lagrange function and $\lambda$ is Lagrange Multiplier.

Function (3.19) will be maximized if first order and second order conditions of a function are satisfied. First order condition needs that partial derivative of a function be equal to zero or:

$$\frac{\partial V}{\partial Q_B} = Q'_B - \lambda P_B = 0 \quad \text{or} \quad Q'_B = \lambda P_B \quad .............................................. 3.20$$

$$\frac{\partial V}{\partial Q_G} = Q'_G - \lambda P_G = 0 \quad \text{or} \quad Q'_G = \lambda P_G \quad .............................................. 3.21$$

where $Q'_B$ and $Q'_G$ are each marginal utility of beef consumption and other goods consumption, respectively. From equation (3.20) and (3.21) we have the following:

$$\lambda = \frac{Q'_B}{P_B} = \frac{Q'_G}{P_G} \quad .............................................. 3.23$$

Equation (3.23) is known as Equimarginal Principle from theory of utility maximization, meaning consumer will be in equilibrium position if the ratios of marginal utility and price of each good consumed are the same and have to be the same as marginal income utility. From three equations (3.20), (3.21) and (3.22), it is known that $Y^0$, $P_B$ and $P_G$ are exogenous variables and $Q_B$ and $Q_G$ are endogenous variables. Thus, demand function can be formulated as follows:
Equation (3.24) indicates that total beef demand is the function of beef price, price of other goods and consumer income. Besides the above factors, other factors that affect demand of a good, among others are total population, government policy, expected price and beef demand level in previous year (Koutsoyiannis, 1977).

Thus demand function for beef can be formulated again and become:

\[ Q^D = f(P^B, P^G, P^E, Y, PS, LQ^D) \] ................................. 3.25

where:
- \( Q^D \) = Total Beef Demand
- \( P^B \) = Beef Price
- \( P^G \) = Beef Substitute or Complement Price
- \( P^E \) = Expected Beef Price
- \( Y \) = Consumer Income
- \( PS \) = Population Size
- \( LQ^D \) = Lag of Total Beef Demand

### 3.2. Elasticity

Elasticity concept is used to measure quantitatively the response of a function towards factors that influence it. Short run elasticity (SRE) and long run elasticity (LRE) for dynamic model (Gujarati, 1995) can be calculated as follows:

\[ SRE = \frac{\Delta Y_t}{\Delta X_t} \times \bar{X}_t/\bar{Y}_t \] ......................................................... 3.33

\[ LRE = SRE / (1 - b) \] ................................................................. 3.34

where:
- \( \bar{X}_t \) = Exogenous Variable Mean
- \( \bar{Y}_t \) = Endogenous Variable Mean
- \( b \) = Estimated Coefficient of Lagged Endogenous Variable

There are three important elasticities in consumer behaviour theory, that is, (1) price elasticity (\( e_p \)), (2) income elasticity (\( e_Y \)) and (3) cross price elasticity (\( e_{xy} \)).
elasticity is the percentage change in quantity for a good that results from a one percent increase in income while cross price elasticity refers to the change in quantity of a good that results from a one percent increase in the price of another good (Pindyck and Rubinfeld, 2005). These elasticities can be calculated as follows:

\[ e_p = \frac{\Delta Q}{\Delta P} \frac{\bar{P}}{\bar{Q}} \] .................................................. 3.35

\[ e_y = \frac{\Delta Q}{\Delta Y} \frac{\bar{Y}}{\bar{Q}} \] .................................................. 3.36

\[ e_{xy} = \frac{\Delta Q_{xy}}{\Delta P_y} \frac{\bar{P}_y}{\bar{Q}_x} \] .................................................. 3.37

where:

\[ Q \] = Total Goods Demanded
\[ \bar{Q} \] =Average Quantity of Goods Demanded
\[ P \] = Price of Goods Demanded
\[ \bar{P} \] = Average Price
\[ Q_x \] = Total Demand of Good X
\[ \bar{Q}_x \] = Average Quantity of X Demanded
\[ P_y \] = Price of Good Y
\[ \bar{P}_y \] = Average Price of Good Y

Goods with elasticity value between 0 – 1 are said to be inelastic and they are necessary goods and between 1 - \( \infty \) are said to be elastic and they are called luxury goods. Long run elasticity is more elastic as compared to short run elasticity. Goods that have substitutes are usually more elastic.

Value of income elasticity for normal goods is positive, zero for neutral goods and negative for inferior goods. Whenever the income elasticity value is more than one, such goods are called luxury goods and when less than one are the necessary goods. Cross elasticity value is used to explain whether a good is a substitute or complement. When the cross elasticity value is negative then good X complement of good Y and when the value is positive then good X is a substitute of good Y.
3.3. Impact of Free Trade Area

Trade agreement of a country can bring either positive or negative effect. Free trade area can result in trade creation and trade diversion. However it should be noted that trade diversion and creation can happen regardless of whether a free trade area or custom union is formed. In the world beef market, Indonesia is a small country which implies that it takes international price as given. New Zealand and Australia are large countries in the world beef market together with other large exporting countries, which will be referred to as the rest of the world.

To graphically demonstrate trade creation and diversion effects of AANZFTA, Indonesia beef imports are divided into imports from Australia and New Zealand, and imports from the rest of the world (ROW). Before the establishment of AANZFTA, Indonesia was importing from any exporting countries applying MFN tariff (the same tariff against all WTO countries) on imports from Australia, New Zealand and ROW. However, after AANZFTA enter into force for Indonesia, import tariff for beef import coming from Australia and New Zealand will be reduced to zero percent in 2020, therefore resulting in trade creation (Figure 5). Consumers in Indonesia will face lower price due to removal of import tariff for beef imports coming from Australia and New Zealand. In all cases, trade creation raise a country’s national welfare.

Figure 5 illustrates the impact of free trade agreement (AANZFTA) on beef industry in Indonesia. It shows the supply and demand curves of beef imports by Indonesia. \( P^0 \) represents the autarky price while \( P^A \) is a free trade supply price of the beef imports from Australia and New Zealand. Australia and New Zealand are assumed capable of supplying the beef at low price. To protect its domestic
beef industry, Indonesia has specific tariff (MFN) $t^A = t^*$ set on imports from Australia and New Zealand. The tariff raises the domestic supply prices to $P_{AT}$. The tariff size $t^* = P_{AT} - P^A$. Indonesian beef imports become $D_1 - S_1$. If Indonesia establish free trade area with New Zealand and Australia such as AANZFTA, tariff on beef imports from these countries will be eliminated, i.e., $t^* = 0$. The domestic prices on beef from Australia and New Zealand will now be $P^A$. Since $P^A < P_{AT}$ Indonesia will now increase its beef import from Australia and New Zealand due to free trade area formed. Then at this lower price imports becomes $D_2 - S_2$.

![Beef Trade Creation as a Result of Participation of Indonesia in AANZFTA](image)

**Source:** Tweeten (1992)

**Figure 5. Beef Trade Creation as a Result of Participation of Indonesia in AANZFTA**

Change in surplus due to participation of Indonesia in AANZFTA as shown in Figure 5 is as follows:

- **Consumer surplus**: $a + b + c + d$
- **Producer surplus**: $-a$
- **Government revenue**: $-c$
Net surplus \( b + d \)

The surplus will be greater if tariff applied is larger and also if supply and demand curves are more elastic.

On the contrary, if Australia and New Zealand as members of AANZFTA, their production is less efficient as compared to ROW, then participation of Indonesia in AANZFTA can lead to decrease in volume traded or trade diversion. Generally, trade diversion means that free trade area diverts trade, away from a more efficient producer outside FTA, towards a less efficient producer within FTA. Figure 6 depicts the case of trade diversion to a country joining FTA. In this case, ROW is assumed capable of supplying beef at lower price than Australia and New Zealand. \( P^R \) is a free trade supply price of beef imports from ROW. Assuming Indonesia has same tariff as above (\( t^* = t^A = t^R \)), then tariff raises the domestic beef price to \( P^A_T \) and \( P^R_T \) for imports from Australia and New Zealand and ROW, respectively. With tariff, Indonesia will import from ROW because \( P^R_T < P^A_T \). The imports will be \( D_3 - S_3 \). Then, assuming Indonesia forms FTA with ASEAN, Australia and New Zealand such as AANZFTA, which means tariff for imports from these countries, is eliminated, i.e., \( t^A = 0 \), while for ROW remains at \( t^R = t^* \). Since \( P^A < P^R_T \), imports will increase to \( D_4 - S_4 \). Since the undistorted (free trade) price in ROW (\( P^R \)) is less than price in Australia and New Zealand (\( P^A \)), trade is said to be diverted from a more efficient producer to a less efficient producer.

Welfare effects as shown in Figure 6 are summarised below:

Consumer surplus \( A + B + C + D \)

Producer surplus \(- A \)

Government revenue \(- (C + E)\)

Net surplus \( B + D - E \)
3. Conceptual Framework

Country’s involvement in regional integration such as free trade area may hurt other sectors of the economy while benefiting others. Among the reasons a country get involved in free trade area is its export in goods that it has comparative advantage. Opponents of free trade area argue that involvement of a country in such free trade may hurt industries with low comparative advantage.

Indonesia’s interest in pursuing AANZFTA is its textile products exports to Australia and New Zealand, while Australia and New Zealand are concerned with their livestock products to Indonesia mainly milk and beef products.

Currently Indonesia is a net importer of beef, i.e., domestic beef production cannot meet domestic beef demand therefore a country has to import. Even though this condition is prevailing, government imposes import tariff on...
both beef and beef cattle to protect domestic beef industry. With tariff, it is expected that import price will be higher than domestic beef price, thus consumers will prefer domestically produced beef. With demand constant and beef imports reduced, supply in the country will decrease hence domestic beef price increases as demand and supply balances. Consumers lose while producers gain.

In the presence of free trade agreement such as AANZFTA in which tariff and non-tariff barriers are completely eliminated, it will be impossible for government to protect domestic industry through tariff. As the result, it is expected that imports will increase, rising supply in the country, driving down domestic beef price hence reducing domestic beef production. Farmers lose in the whole.

Although comparative advantage principle states that a country should produce goods in which it comparatively advantaged and import goods in which is disadvantaged, it is better for a country to produce than to rely fully on imports. Therefore, knowing the factors that affect domestic supply and demand of beef and the resulting impact of Indonesia in participating in AANZFTA on beef industry, then appropriate development policies to increase domestic beef production and curb imports can be formulated or policy related to AANZFTA implementations on the performance of beef industry.

3.5. **Hypothesis**

1. Reduction of beef import tariff will increase domestic beef supply, reduce domestic beef price hence domestic beef production, therefore reducing producer surplus.
2. Reduction of beef import tariff will reduce import price, increase import demand and thereby increasing beef supply in the country as a result reduce domestic price and increase consumer surplus.