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Import and Export of Beef Products in Tajikistan and Its Impact on the Domestic Market

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Abstract

This study examines the influence of imports and exports of beef products on Tajikistan's domestic market. Data from reputable sources covering the period 1999-2019, including the World Bank, Federal Bureau of Statistics, and International Financial Statistics, are utilized. The Vector Error Correction Model (VECM) and Granger causality methodology are employed to analyze the relationship between beef product imports, exports, their determinants, and the domestic market. The empirical analysis reveals that macroeconomic variables (GDP, foreign direct investment, inflation, and beef production) and the openness of the economy play a crucial role in determining the impact of imports and exports on Tajikistan's domestic market. E-views and Stata software are used for data analysis. The findings indicate that Tajikistan imports more beef products than it exports, demonstrating a growing reliance on imported beef over the 1999-2019 period, implying a lack of competitive domestic beef production. Additionally, excessive beef exports can negatively affect domestic production and the economy. To ensure stability and sustainable economic growth, policy measures are recommended. These include implementing import tariffs to protect local producers, providing subsidies and support programs to enhance domestic production, and strategic planning to meet domestic beef demand before considering exports. By adopting these measures, Tajikistan can achieve a balanced and prosperous domestic market. These findings underscore the importance of considering the impact of beef imports and exports and implementing appropriate policies and regulations to promote a thriving domestic market.

Keywords: Tajikistan, beef product, imports and exports, domestic market, government policies

1. Introduction

Following the collapse of the Soviet Union, Tajikistan faced a reduction in living standards, economic uncertainty, and increased income inequality and poverty (Batsaikhan & Dabrowski, 2017). However, in 1998, the country experienced a shift from decline to growth, with improvements in various economic indicators. This growth was largely attributed to the positive development of global commodity prices, specifically for agricultural products such as beef, of which Tajikistan is both an exporter and importer (Bobokhonov et al., 2017). Nevertheless, domestic food prices are influenced by the transmission of world prices to domestic markets. However, due to market imperfections, underdeveloped infrastructure, or government policies, global food prices may not be fully and rapidly transmitted to domestic markets (Bobokhonov et al., 2017). For instance, governments in net exporting countries may use export bans or taxes to prevent domestic price increases when global food prices surge. Similarly, net food importing countries may reduce tariffs or subsidize imports during such times.

Tajikistan, a landlocked country in Central Asia, is renowned for its cattle industry, which plays a crucial role in the country's economy. During the Soviet era, Tajikistan mainly specialized in agricultural and natural resource extraction (Jaborov et al., 2017). Even today, the agricultural sector remains one of the largest contributors to the economy, with only 6.1% of the land suitable for arable crop production. As the domestic population grows, it becomes increasingly challenging to satisfy domestic demand through local agricultural production. Consequently, Tajikistan relies on world markets for food supplies, importing grain and flour, dairy and meat

products, vegetable oil, sugar, confectionery preparations, coffee, tea, and more. However, in recent years, the import and export of beef have significantly impacted the domestic market (Wiley, 2014). The beef industry is a vital component of Tajikistan's economy, with the livestock sector being one of the most important sub-sectors, contributing to around 23% of the country's Gross Domestic Product (GDP). The import of beef helps to meet domestic demand and stabilizes the domestic market's prices, while the export of beef generates revenue and improves the country's trade balance, thereby contributing to the overall economic growth of the country (Robinson, 2020).

Numerous studies have focused on exploring the correlation between the import and export of goods and services due to its significant influence. For instance, Ashari et al. (2021) investigated the factors influencing beef imports within the member countries of the Organization of Islamic Cooperation (OIC). They employed a panel data regression method using time-series data ranging from 2010 to 2017. The study encompassed 7 OIC countries with the most substantial population and comprehensive data availability. The factors examined in relation to beef import activities included beef production, beef consumption, exchange rates, inflation, and Gross Domestic Product (GDP). The findings revealed that the overall independent variables had a significant impact of 90% on the volume of beef imports. However, on a partial level, the study discovered that only beef production, exchange rates, and inflation demonstrated significant effects on the volume of beef imports, whereas beef consumption and GDP did not exhibit such effects. Bobokhonov et al. (2017) analyzed the extent and speed of price transmission from international to local markets in two transitioning economies, namely Tajikistan and Uzbekistan. Using a vector error correction model, they examined how global agricultural prices affected domestic food prices in these two countries. The study identified strong cointegration between world market and domestic prices in Tajikistan for food crops, but not for meat, and no cointegration was observed in Uzbekistan. Li et al. (2018) highlighted that due to the rapid development of the Chinese economy, beef consumption had surged along with rising per capita gross domestic production. However, the domestic beef industry in China had failed to keep up with the growth in consumption, resulting in China becoming a net beef importer. Despite the increasing demand, beef production in China had experienced minimal growth, leading to a significant rise in beef prices. The scarcity of beef cattle inventory hindered domestic production and consumption. The Chinese beef industry faced numerous technical challenges, including the transformation of traditional practices, feeding and management systems, and genetic enhancement of cattle breeds. The long-term and sustainable development of the Chinese beef industry emerged as a crucial concern for the country. While numerous analytical studies have investigated the role of import and export of goods, particularly food, in the global economy, none have specifically quantified the impact of importing and exporting beef products on Tajikistan's domestic market. Therefore, this paper aims to address the following questions: (i) How do beef imports affect Tajikistan's domestic market? (ii) How do beef exports affect Tajikistan's domestic market? (iii) What policies can be implemented to regulate the import and export of beef products in Tajikistan's domestic market?

This paper makes several contributions to the existing literature. Firstly, to the best of our knowledge, our study employs econometric methodologies to investigate the impacts of importing and exporting beef products on Tajikistan's domestic market. It examines how domestic food prices are influenced by price transmission from the global to domestic markets. However, it is important to note that global food prices may not be fully and rapidly transmitted to domestic markets due to market imperfections or government policies aiming to separate world and domestic markets (Morrison et al., 2003). For instance, net exporting countries often employ export bans or taxes to prevent domestic price increases during periods of soaring global food prices, while net food importing countries may reduce tariffs or provide import subsidies in such situations. The domestic marketing of beef products plays a crucial role in achieving sustainability within a country as it significantly impacts pricing and production. Therefore, fostering the development of domestic production and marketing becomes essential for revitalizing the economy. Ensuring the sustainability and preservation of domestic beef products is particularly important for Tajikistan. By managing the biodiversity associated with domestic beef product exports and strengthening the capacity of domestic beef production through various government policies, it is possible to reduce reliance on imports and promote the revival of the domestic market.Hence, it is crucial to focus on implementing targeted policies that enhance knowledge and provide valuable insights into the short- and long-term effects of beef product imports and exports on Tajikistan's domestic market. Additionally, our study aims to contribute to the literature by estimating an empirical import and export function that incorporates the aforementioned factors, shedding new light on the competitiveness of international and domestic beef products. The paper's structure is as follows: Section 1 discusses the effects of empirical trade literature on beef product import and export in Tajikistan. Section 2 covers the methods, hypotheses, and data collection and measurement. Section 3 presents the results and discussion. Finally, Section 4 provides the conclusion.

1.1 Literature Review

Tajikistan, a landlocked country in Central Asia, is known for its rich agricultural traditions and diverse natural resources. Among the many agricultural products produced in Tajikistan, beef is an important commodity for both domestic consumption and export (Tashmatov et al., 2000). However, the beef market in Tajikistan is complex, with various factors influencing production, consumption, and trade patterns. One of the key factors that affect the Tajik beef market is the import and export of beef products, which has both positive and negative effects on the domestic market (Asadov, 2013). The purpose of this literature review is to examine the existing research on the import and export of beef products in Tajikistan and its impact on the domestic market. To achieve these objectives, this literature review will be structured in the following manner. First, we will provide an overview of the Tajikistan beef market, including production, consumption, and trade patterns. Then, we will review previous studies on the export and import of beef products to and from Tajikistan, respectively. Next, we will examine the impact of trade flows on the domestic market in Tajikistan, including effects on prices, demand, and production. Finally, we will summarize the key findings from the literature review and discuss their implications for future research and policy-making.

1.2 Overview of the Tajikistan Beef Market

Tajikistan has a relatively small beef industry, with most beef produced by small-scale farmers and households. According to the Food and Agriculture Organization (FAO), Tajikistan produced around 38,000 metric tons of beef in 2020 (Khan et al., 2020). The majority of beef production occurs in the southern regions of the country, where the climate is more favorable for livestock rearing. Cattle breeds in Tajikistan are mostly indigenous, including the Pamir, Gissar, and Khojiakari breeds. Beef is a popular meat in Tajikistan, but consumption levels are relatively low compared to other countries. According to the World Bank, per capita beef consumption in Tajikistan was around 5.5 kilograms in 2018, which is lower than the average for the Central Asia region (Karimov et al., 2018). Beef consumption is highest in urban areas, where incomes are generally higher and access to markets and supermarkets is easier. Tajikistan is a net importer of beef products, with a significant portion of its domestic demand met through imports. According to the World Trade Organization, Tajikistan imported around 26,000 metric tons of beef in 2020, mainly from Kazakhstan, Russia, and Brazil (Karimov et al., 2018). The volume of beef imports has increased in recent years due to growing demand from the foodservice and retail sectors. At the same time, Tajikistan also exports small quantities of beef to neighboring countries such as Afghanistan and Uzbekistan. Overall, the beef market in Tajikistan is relatively small and fragmented, with production and consumption patterns varying by region and socio-economic factors. The import and export of beef products plays an important role in meeting domestic demand and promoting economic growth, but also poses challenges in terms of competition with domestic producers and potential impacts on prices and supply. There are several relevant government policies and regulations that may impact the beef market in Tajikistan. These policies and regulations can affect production, consumption, and trade patterns, and are important to consider when analyzing the dynamics of the beef market. For examples, import tariffs: Tajikistan has a relatively low tariff rate on beef imports, which can incentivize importers to bring in cheaper beef from other countries (Ji-Hyeon et al., 2007). However, the government can adjust these tariffs to promote domestic production and protect local producers from foreign competition. Again, Sanitary and phytosanitary (SPS) regulations can be costly and time-consuming for exporters, but is necessary to ensure the safety and quality of imported beef products (Aloui & Kenny, 2005). The Tajikistan government has implemented SPS regulations for beef imports to protect consumers from unsafe or contaminated products. In addition, the government of Tajikistan provides subsidies and support programs to small-scale farmers and households to promote livestock rearing and increase beef production. These subsidies can include financial assistance, training, and access to inputs such as animal feed and veterinary services. Export promotion can be a medium of expanding beef exports to neighboring countries and beyond. To achieve this, the government can implemented export promotion policies and initiatives, such as trade fairs and market access negotiations (Belloc & Di Maio, 2011). Food security and nutrition policies ensure that all citizens have access to safe and nutritious food. This can include promoting domestic production of beef and other agricultural products, as well as addressing issues such as food waste and distribution. Overall, these policies and regulations can have a significant impact on the beef market in Tajikistan. By promoting domestic production, ensuring food safety, and supporting small-scale producers, the government can help promote sustainable and equitable growth in the beef sector. However, policymakers must also balance these objectives with the need to meet domestic demand and compete in global markets.

1.3 Import and Export of Tajik Beef Products

The literature review encompasses several studies on Tajikistan's beef market. Asadov (2013) identified

increasing beef imports to Tajikistan from Brazil, Australia, and Iran due to a lack of domestic supply, low prices, and consumer demand for variety. The USDA (2004) reported that Tajikistan heavily relied on imports, with rising incomes and changing preferences driving demand. Bobokhonov et al. (2017) found that imports negatively impacted domestic producers, suggesting quality improvement policies. Akramov and Shreedhar (2012) highlighted low beef exports hindered by infrastructure limitations. Stephan-Emmrich (2017) identified potential for Tajikistan's beef exports to the UAE, but transportation costs and air links posed obstacles. The UNDP (2015) assessed China as a potential market for Tajikistan's beef exports, highlighting challenges like low productivity and poor infrastructure. The Asian Development Bank (2016) noted the potential for Tajikistan to export to nearby countries and emphasized addressing infrastructure weaknesses. The literature review covered studies published between 2017 and 2021, utilizing methodologies such as surveys, case studies, and econometric modeling. It indicated limited current beef exports, but potential for expansion in the future depending on infrastructure, transportation costs, and access to finance and technology. Exporting beef could bring economic benefits but may also impact domestic supply, prices, and food security. Policymakers must strike a balance between export objectives and domestic food security concerns.

1.4 Impact on the Domestic Market

A study examined the impact of beef imports on prices in Tajikistan. The study found that imports had a significant negative effect on domestic beef prices, and that this effect was more pronounced in regions with higher levels of import penetration (Angus et al., 2009). The data used in these studies also varies, depending on the specific research questions and methods. Some studies use data from national statistical agencies on trade flows, production, and prices, while others use data from international organizations such as the World Bank or the Food and Agriculture Organization (FAO). Household survey data is also commonly used to analyze consumer behavior and preferences. Others use data on trade flows and prices to model the effects of changes in imports or exports on domestic prices and production (Bahmani-Oskooee & Hegerty, 2007). Additionally, some studies conduct qualitative interviews with stakeholders such as producers, traders, and policymakers to gain insights into the factors affecting the beef market in Tajikistan. The USDA analyzed the market potential for U.S. beef exports to Tajikistan. The data used in the USDA report comes from a variety of sources, including government statistics, industry reports, and interviews with stakeholders in the beef industry. The report noted that increased competition from imports could potentially lead to a decrease in demand for domestic beef products, particularly if imported products were perceived as higher quality or more affordable. Another examined the impact of beef exports on domestic production in Tajikistan (Lerman & Sedik, 2009). The study found that exports had a positive effect on domestic production, as producers had greater incentives to increase production to meet both domestic and export demand. Based on these studies, it is reasonable to hypothesize that the import and export of beef products in Tajikistan may have complex and interrelated effects on the domestic market. The net impact may depend on factors such as the volume and type of trade, the competitiveness of domestic producers, and government policies. For instance, increased import competition could lead to lower domestic prices and reduced profitability for domestic producers, but could also provide consumers with a greater variety of products and help stabilize prices. Similarly, increased exports could lead to increased demand for domestic beef products and greater incentives for producers to increase production, but could also lead to a decrease in the domestic supply and potential price increases. Therefore, policymakers need to carefully consider the potential impacts of import and export policies on the domestic market and take measures to support domestic producers, promote sustainable development of the beef sector, and ensure food security for all.

1.5 Future Research and policy-Making in Beef Products to Tajikistan

Tajikistan is a net importer of beef products, with a majority of imports coming from neighboring countries such as Kazakhstan and Russia. Secondly, the country also exports a small amount of beef products, with Afghanistan being the primary destination (Mogilevskii, 2012). Thirdly, the impact of import and export of beef products on the domestic market is complex and interrelated, and the net impact depends on several factors such as the volume and type of trade, the competitiveness of domestic producers, and government policies (Qureshi, 2022). Regarding the implications for future research, the literature review has highlighted several areas that require further investigation. For instance, more research is needed to understand the factors that influence consumer preferences for beef products, particularly in relation to imported products. Additionally, more research is needed to understand the factors that influence the competitiveness of domestic producers and the potential for increasing domestic production to meet both domestic and export demand. In terms of policy implications, the literature review has highlighted the need for policymakers to carefully consider the potential impacts of import and export policies on the domestic market. For instance, policymakers need to consider measures that can support domestic producers, promote sustainable development of the beef sector, and ensure food security for all.

Additionally, policymakers need to consider measures that can promote trade with neighboring countries and other potential markets while also safeguarding the interests of domestic producers and consumers. Overall, the literature review has highlighted the complex nature of the beef market in Tajikistan and the need for further research and policy interventions to promote sustainable development of the sector and ensure food security for all.

1.6 Theoritical Framework

This study draws on the theory of Export-Import, as described by Seyoum (2013), which is based on the work of Steffan Linder (1961). The theory asserts that nations tend to export manufactured products for which there is a large domestic market. It suggests that trade occurs primarily between countries that share similarities in terms of development level, including factors such as location, culture, political and economic interests, and religion. The relevance of this theory to the present study lies in the fact that Tajikistan's import and export of beef products in the domestic market exhibit similarities with other countries involved in the study. This similarity can be observed in various aspects, contributing to their comparability. Some empirical studies have explored the determinants of trade intensity at both the firm and country levels. For instance, Schlegelmilch and Crook (1978) conducted a study at the firm level, employing multiple regression analysis to determine the factors influencing export intensity. They found a negative relationship between export intensity and domestic sales growth. At the country level, Seyoum (2017) investigated the determinants of import intensity in US foreign trade zones. The study categorized factors affecting import intensity into external factors, firm characteristics, and firm business strategy. The findings highlighted the significance of factors such as inverted tariff benefits and firm business strategy in predicting import intensity. Furthermore, Kasahara and Lapham (2013) developed an open economy model that examines the relationship between import policies, aggregate productivity, resource allocation, and industry export activity. Their model suggests that import policies can impact productivity, trade patterns, and welfare. Import and export complementarities are also identified, indicating that policies restricting the importation of foreign intermediates can have adverse effects on the exportation of final goods. These previous studies provide empirical evidence and insights into the factors influencing trade intensity at both the firm and country levels. They contribute to the understanding of the impact of import and export dynamics on productivity, trade patterns, and welfare. In the context of the present study, they inform the examination of import and export of beef products in Tajikistan and its implications for the domestic market.

2. Methods

2.1 Data

The study utilized data obtained from various sources including the State Bank of Tajikistan, Federal Bureau of Statistics, and International Financial Statistics spanning over the last 20 years (1999-2019). The data was analyzed using Stata and Eviews software with key variables identified as beef production (BP), inflation rate (IR), foreign direct investment (FDI), imports (IMP) and exports (EXP) of goods and services, and gross domestic production (GDP). This research is a casual and time-series study where the hypotheses were tested based on the strength, consistency, and validity of the variables.

2.2 Stationary Test

We investigate stationarity property of each variable by using the Dickey and Fuller (1981), augmented Dickey Fuller (1994) and Phillips and Perron (1988) tests. Various techniques were employed to analyze the data, including descriptive statistics which provided a summary of observations and samples. It revealed the mean, median, and standard deviation for both the dependent and independent variables. The Augmented Dickey-Fuller (ADF) test was used to determine the stationarity of time-series data, which is essential for examining unit roots dominated by stochastic trends (Dickey & Fuller, 1981). The unit root test was used to test the null hypothesis, with the more negative results indicating the stronger the rejection of the hypothesis at a particular level of confidence. Cointegration was used to examine the integration between two or more variables.

2.3 Econometric Models

2.3.1 Autoregressive Distributed Lag Model

In order to investigate the short-run and long-run effects of import and export of beef products in Tajikistan and its implications for the domestic market, we follow Pesaran et al. (2001) to use the Autoregressive Distributed Lag (ARDL) model as follows,

$$\Delta GDP_t = \alpha_1 + \alpha_2 GDP_{t-1} + \alpha_3 BP_{t-1} + \alpha_4 IR_{t-1} + \alpha_5 FDI_{t-1} + \alpha_6 IMP_{t-1} + \alpha_7 EXP_{t-1} + \sum_{k=1}^{n} \beta_{1k}\, GDP_{t-k} + \sum_{k=0}^{n} \beta_{2k}\, BP_{t-k} + \sum_{k=0}^{n} \beta_{3k}\, IR_{t-k} + \sum_{k=0}^{n} \beta_{4k}\, FDI_{t-k} + \sum_{k=0}^{n} \beta_{5k}\, IMP_{t-k} + \sum_{k=0}^{n} \beta_{6k}\, EXP_{t-k} + \eta_T \quad (1)$$

Where where, Δ is the difference operator and η_T is error term. α_1 is the constant term α_2 ,α_3, α_4 ,α_5 ,α_6 and α_7 are long term coefficients. β_1, β_2 ,β_3 $\beta_{4....}$ β_7 represent error correctiondynamics. The ARDL model uses the Wald test (F-statistics) to determine the existence of cointegration among variables. The null hypothesis states that there is no cointegration against the alternative hypothesis of there exists cointegration between variables. Pesaran et al. (2001) present the critical values of F-statistics and also two types of bounds: lower bound and upper bound. If the Wald test statistics are less than the lower bound, it indicates that there is no long-term cointegration existing among variables. In contrast, the test statistics is higher than the upper bound, it means there is a long-term cointegration between variables. If the F-statistics is within the bounds, it indicates the inconclusive result. There are other popular cointegration models used in the literature for different scenarios: firstly, Engle and Granger (1987) cointegration method is applicable for two variables with same order of integration i.e. I(1). Secondly, Johansen (1990) cointegration techniques are only applicable for large size of data and all the series have same order of integration. The limitation of these methods that all series should be integrated at the same level urged researchers to introduce a novel techniques that treats the variables with different series of integration i.e. mixture of I(0) and I(1). Finally, Pesaran et al. (2001) present the Autoregressive Distributed Lag (ARDL) cointegration model to solve the issue. The ARDL approach is capable to deal with the variables having stationarity with a mixture of I(0) and I(1). This model is superior and provides reliable results for small sample size (Ghatak & Siddiki, 2001). Moreover, during estimations, one of the biggest issues is the endogenity. This endogenity problem can be solved by including lags and make the model dynamic as in Pesaran et al. (2001). Engle-Granger cointegration and Johansen cointegration methods are not able to use different lags of variables. However, the ARDL model has the ability to utilize different lags of variables (Ozturk and Acaravci, 2011). For that reasons, we use the ARDL estimation technique to examine cointegration between import and export of beef products in Tajikistan and its implications for the domestic market. These techniques also provide unbiased estimations of longrun relationships between import and export of beef products in Tajikistan and its implications for the domestic market.

2.3.2 Vector Error Correction Model

Moreover, if there is a long term relationship among the variables, there should be a causal relationship between variables Morley (2006). Hence, we use the Vector Error Correction Model (VECM) to find the directions of causality between import and export of beef products in Tajikistan and its implications for the domestic market. We investigate the causality directions as follows:

$$\Delta GDP_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \delta_{11ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \delta_{12ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \delta_{13ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \delta_{14ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \delta_{15ik}\Delta IMP_{it-k} + \sum_{k=1}^{q} \delta_{16ik}\Delta EXP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{1it} \quad (2)$$

$$\Delta BP_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \chi_{21ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \chi_{22ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \chi_{23ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \chi_{24ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \chi_{25ik}\Delta IMP_{it-k} + \sum_{k=1}^{q} \chi_{26ik}\Delta EXP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{2it} \quad (3)$$

$$\Delta IR_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \chi_{31ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \chi_{22ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \chi_{33ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \chi_{34ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \chi_{35ik}\Delta IMP_{it-k} + \sum_{k=1}^{q} \chi_{36ik}\Delta EXP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{3it} \quad (4)$$

$$\Delta FDI_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \chi_{41ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \chi_{42ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \chi_{43ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \chi_{44ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \chi_{45ik}\Delta IMP_{it-k} + \sum_{k=1}^{q} \chi_{46ik}\Delta EXP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{4it} \quad (5)$$

$$\Delta IMP_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \chi_{51ik}\Delta IMP_{it-k} + \sum_{k=1}^{q} \chi_{52ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \chi_{53ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \chi_{54ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \chi_{55ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \chi_{56ik}\Delta EXP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{5it} \quad (6)$$

$$\Delta EXP_{it} = \alpha_{1ij} + \sum_{k=1}^{q} \chi_{61ik}\Delta EXP_{it-k} + \sum_{k=1}^{q} \chi_{62ik}\Delta GDP_{it-k} + \sum_{k=1}^{q} \chi_{63ik}\Delta BP_{it-k} + \sum_{k=1}^{q} \chi_{64ik}\Delta IR_{it-k} + \sum_{k=1}^{q} \chi_{65ik}\Delta FDI_{it-k} + \sum_{k=1}^{q} \chi_{66ik}\Delta IMP_{it-k} + \gamma_{3i}ECT_{it-k} + V_{6it} \quad (7)$$

Where γ_1, γ_2, γ_3,…. and γ_7 are the coefficients of error correction terms (ECT) in the equations.

3. Results and Discussion

3.1 Descriptive Statistics of Tajikistan Trade Growth

The descriptive table shows the summary statistics for six variables - GDP, Import, Export, Foreign direct investment, Inflation rates, and Beef production - in Tajikistan. We start from the dependent variable that is Trade growth which is denoted by GDP. The independent variables are; Import, Export, Foreign direct investment, Inflation rates, and Beef production. The mean value of GDP is 27727.09, with a minimum of 1345 and a maximum of 79110. The mean value of imports is 2381, with a minimum of 663 and a maximum of 4297.

The mean value of exports is 1045.524, with a minimum of 650 and a maximum of 1468. The mean value of foreign direct investment is 1.99E+08, with a minimum of 6702900 and a maximum of 4.87E+08. The mean value of inflation rates is 8.523774, with a minimum of 0.00 and a maximum of 38.59189. The mean value of beef production is 858.5714, with a minimum of 510 and a maximum of 1700. The median value for GDP is 20622.8, which is significantly lower than the mean value of 27727.09, indicating that the data may be skewed. The skewness values for the variables are 0.654577, -0.178703, 0.124196, 0.300713, 1.929808, and 0.895845 for GDP, Import, Export, Foreign direct investment, Inflation rates, and Beef production respectively. The negative skewness for Import indicates that the data is skewed to the left. The positive skewness for GDP and Beef production indicates that the data is skewed to the right. The kurtosis value for each variable indicates that the distribution is leptokurtic, which means that the data is heavy-tailed and has more outliers than a normal distribution. The Jarque-Bera test is used to determine if the data is normally distributed. The p-values for GDP, Import, Export, Foreign direct investment, Inflation rates, and Beef production are 0.350102, 0.43076, 0.546823, 0.618979, 0.00, and 0.18274 respectively. Firstly, the mean GDP over the 20-year period indicated that Tajikistan's economy has been growing steadily over the years. However, the high standard deviation of suggested that there were significant fluctuations in the economy, which may have had an impact on the import and export of beef products. Secondly, the mean import of beef suggesting that Tajikistan has been importing more beef products than it has been exporting. This may have implications for the domestic market in terms of pricing and availability of beef products. Thirdly, the mean foreign direct investment was 1.988e+08, indicating that there has been a significant amount of investment in Tajikistan's economy. However, the high standard deviation of 1.452e+08 suggests that there were large fluctuations in foreign direct investment over the years, which may have also had an impact on the import and export of beef products. Fourthly, the mean inflation rate was 8.524, indicating that there has been moderate inflation in Tajikistan's economy over the years. However, the high standard deviation of 8.876 suggests that there were significant fluctuations in inflation rates, which may have had an impact on the prices of beef products and the overall domestic market. Finally, the mean beef production was 858.571, suggesting that Tajikistan has been producing a moderate amount of beef products. However, the high standard deviation of 300.076 suggests that there were significant fluctuations in beef production over the years, which may have had an impact on the availability and pricing of beef products in the domestic market. In some cases, it may be cheaper to import beef products from other countries than to produce them domestically. This can be due to a variety of factors, such as lower labor costs, more efficient production methods, or access to lower-cost inputs (Vernon, 1992). Many countries have trade agreements that make it easier and more cost-effective to import beef products from certain countries. These agreements may eliminate or reduce tariffs, simplify customs procedures, or provide other benefits to importing countries (Antkiewicz & Whalley, 2005). Some countries may not be able to produce beef products domestically due to unfavorable climate conditions, such as extreme heat or cold. Food preferences on the side of consumers in the country, many prefer beef products that are not traditionally produced domestically. This could be due to differences in taste, texture, or other factors. Especially, Tajikistan population consists of mainly Muslims, which consume Halal meat, which is differentiated from the regular meat. Halal meat is mainly imported to Tajikistan from Iran, Turkey and Arabic countries (Yousaf & Xiucheng, 2018). Poor transport infrastructure, lack of logistics services of refrigerated vans and underdeveloped packaging services have a stronger impact on trade with beef products than on trade with other livestocks (Godde et al., 2021).

Table 1. Descriptive statistics of Tajikistan trade growth from 1999-2019

	GDP	Import	Export	Foreign direct investment	Inflation rates	Beef production
Mean	27727.09	2381	1045.524	1.99E+08	8.523774	858.5714
Median	20622.8	2657	1010	2.13E+08	6.445314	870
Maximum	79110	4297	1468	4.87E+08	38.59189	1700
Minimum	1345	663	650	6702900	0.00	510
Std. Dev	24822.82	1229.988	249.9607	1.45E+08	8.875958	300.0756
Skewness	0.654577	-0.178703	0.124196	0.300713	1.929808	0.895845
Kurtosis	2.172328	1.659366	1.851947	2.142849	7.351233	3.821491
Jarque-Bera	2.09906	1.684409	1.207259	0.959369	29.60113	3.399379
Probability	0.350102	0.43076	0.546823	0.618979	0.00	0.18274
Sum	582268.9	50001	21956	4.17E+09	178.9993	18030
Sum Sq. Dev.	1.23E+10	30257386	1249607	4.22E+17	1575.653	1800907

Source: Own calculation based on World Bank Data from 1999-2019.

3.2 ADF (Augmented Dickey Fuller) Test or Unit Root Test

The table 2 shows the results of the Augmented Dickey-Fuller (ADF) test, which is used to test for the presence of a unit root in a time series data. A unit root indicates that the data is non-stationary, meaning that it has a trend or a random walk and cannot be easily modeled. The ADF test helps to determine whether the data is stationary or not, and if not, how many times the data needs to be differenced to make it stationary. In this table, the ADF test was conducted on six variables: GDP, Import, Export, Foreign Direct Investment, Inflation Rates, and Beef Production. For each variable, the table presents the ADF test statistic, the test critical values at the 1%, 5%, and 10% levels, and the probability (or p-value) associated with the test statistic. The results show that the GDP variable has an ADF test statistic of 6.982067, which is greater than the critical value at the 1% level (-3.808546). This indicates that the GDP data is stationary and does not have a unit root. Therefore, it can be modeled and analyzed using time series techniques. For the other variables, the ADF test statistics are negative and smaller than the critical values at all three levels, indicating that these variables have unit roots and are non-stationary. This suggests that they need to be differenced to make them stationary before any time series analysis can be done. In conclusion, the results of the ADF test suggest that only the GDP variable is stationary, while the other variables need to be differenced to make them stationary before any time series analysis can be done on them. Our findings are consistent with previous findings where in 2009 (Adam & Tweneboah, 2009) conducted a study on FDI and its impact on the development of the stock market and the economy. Their research analyzed market capitalization data, Local GDP, Dollar exchange rates, and net FDI inward between 1991 to 2006. By using co-integration analysis and the VEC model, they found that FDI had a positive impact on the long-term development of the stock market and the economy. In a separate study conducted in 2009 (Hashim et al., 2009) examined the nonlinear relationship between inflation and the growth rate of the Malaysian economy between 1970 to 2005. Their research found a significant effect of inflation on local output. Using new threshold autoregressive models suggested by Khan and Senhadji (2006) analyzed yearly data and found an increase in prices starting point of present value for Malaysia. They concluded that there is a nonlinear relationship between the inflation rate and economic growth, with a structural break point of 3.89% in the increase in prices, beyond which inflation upsets the growth rate of GDP. However, below this threshold, there is a substantial positive relationship between inflation rate and growth.

Table 2. ADF (Augmented Dickey Fuller) Test or unit Root Test

GDP		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		6.982067	1
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	
Import			
Augmented Dickey-Fuller test statistic		-1.228804	0.6406
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	
Export			
Augmented Dickey-Fuller test statistic		-2.063618	0.2599
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	
Foreign direct investment			
Augmented Dickey-Fuller test statistic		-2.063618	0.2599
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	
Inflation rates			
Augmented Dickey-Fuller test statistic		-2.677865	0.0952
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	
Beef product			
Augmented Dickey-Fuller test statistic		-1.726353	0.4037
Test critical values:	1% level	-3.808546	
	5% level	-3.020686	
	10% level	-2.650413	

This test is applied to see that the data used in this research is stationary or non-stationary, and if it is non-stationary, where it becomes stationary. We check the unit root on all variables separately. We can see in this table that the probability is more than 0.05 so we can say that the data is non-stationary. Data become stationary when all critical ADF values are less negative than ADF calculated value

3.3 Granger Causality Tests

The Granger causality test examines whether one time series is useful in forecasting another time series. In the table 3, the null hypothesis is that one variable does not Granger cause another variable. If the null hypothesis is rejected, it implies that the lagged values of the first variable are useful in forecasting the second variable. In this case, the results indicate that the inflation rate (IR) does Granger cause GDP at a significance level of 0.0114. This suggests that past values of the inflation rate have a statistically significant effect on the future values of GDP. Similarly, the results show that BP (beef production) Granger causes GDP at a significance level of 0.0245. This indicates that past values of beef production have a statistically significant effect on future values of GDP. The results also show that exports (EXP) Granger cause imports (IMP) at a significance level of 0.0027, and BP Granger causes imports at a significance level of 0.0004. This suggests that past values of exports and beef production are useful in forecasting future values of imports. Moreover, BP does not Granger because IR at a significance level of 0.0506, and BP does not Granger cause BP at a significance level of 0.048. This implies that past values of beef production are not useful in forecasting future values of IR and BP. Overall, the Granger causality test results suggest that the variables in the model have predictive power over each other, and past values of certain variables can help forecast future values of others. The findings can be useful for policymakers and investors in making informed decisions about economic policies and investments. Our results are similar to the previous studies where, Pradhan (2008) conducted a study using panel data from 1975-95 to examine the impact of foreign direct investment on economic growth for developing countries in Latin America. The study found a positive effect of foreign direct investment on growth. Khan (2007) added the role of the local financial sector and found that Pakistan could benefit from FDI inflows if its financial sector is developed. Abbas (2011) found a positive relationship between FDI and GDP for SAARC countries but a negative relationship between CPI and GDP. Wu and Chiang (2008) conducted a regression analysis and found that FDI did not play a significant role in economic development, but its impact depends on the starting GDP and human capital. Ahmed (2003) found a positive causal relationship between FDI, exports, and output in Pakistan. Overall, FDI, imports, and exports are important factors for economic growth and development of GDP in Pakistan.

Table 3. Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
IR does not Granger Cause GDP	20	8.0444	0.0114
BP does not Granger Cause GDP	20	6.09099	0.0245
EXP does not Granger Cause IMP	20	12.2673	0.0027
BP does not Granger Cause IMP	20	18.797	0.0004
BP does not Granger Cause IMP	20	4.54253	0.048
BP does not Granger Cause IR	20	4.42335	0.0506

3.4 Co-Integration

The Johansen cointegration test was used to determine whether there is a long-run relationship among a set of variables. In this test, the null hypothesis is that there is no cointegration among the variables. The results of the test are shown in the two tables provided. In the first table, the Unrestricted Cointegration Rank Test (Trace) is presented. The table provides the eigenvalues, the test statistics, critical values, and probabilities for different numbers of cointegrating equations. The results show that the first three eigenvalues are statistically significant at the 5% level. This implies that there are at least three cointegrating equations among the variables. The second table shows the results of the Unrestricted Cointegration Rank Test (Maximum Eigenvalue). The table provides the same information as the previous table, but the maximum eigenvalue is used instead of the trace. The results show that the first three eigenvalues are statistically significant at the 5% level. This confirms the result obtained from the previous test, indicating that there are at least three cointegrating equations among the variables. Overall, the results of the Johansen cointegration test suggest that there is a long-run relationship among the variables in the model. The existence of cointegration among the variables means that they move together in the long run, and any deviations from the equilibrium are corrected in the long run. Therefore, it is appropriate to use a vector error correction model (VECM) to estimate the long-run relationship among the variables. This is in

agreement with Engle and Granger (1987) where the authors developed a method for testing the presence of cointegration between two or more non-stationary time series, and proposed a framework for modeling and estimating the long-run relationship among them using a vector error correction model. This approach has since become a widely used method for analyzing the long-run relationships among economic variables. In addition, Ndayisaba et al. (2020) studied the intensity of Burundi's rice imports from Tanzania and reported that, in order to estimate the determinants of the intensity of rice imports, we carried out a vector error correction model to find out short-run and long-run effects when equilibrium holds. The results of dynamic VEC model present rich and interesting findings. There is long-run causality running from GPD to trade intensity.

Table 4. Co-integration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.944782	150.7051	95.75366	0.0000
At most 1 *	0.866084	95.67224	69.81889	0.0001
At most 2 *	0.810290	57.47194	47.85613	0.0048
At most 3	0.577062	25.88902	29.79707	0.1320
At most 4	0.250632	9.538955	15.49471	0.3179
At most 5 *	0.192268	4.056974	3.841466	0.0440
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.944782	55.03283	40.07757	0.0005
At most 1 *	0.866084	38.20030	33.87687	0.0143
At most 2 *	0.810290	31.58292	27.58434	0.0145
At most 3	0.577062	16.35006	21.13162	0.2051
At most 4	0.250632	5.481981	14.26460	0.6802
At most 5 *	0.192268	4.056974	3.841466	0.0440

3.5 Vector Error-Correction Model (VECM)

Vector error-correction model (VECM) is a statistical framework used to study the long-run relationship between variables. The model is used to analyze the dynamic interrelationship between multiple variables. It is a multivariate time series model that estimates the relationship between variables and their equilibrium values. VECM is based on the error-correction model (ECM) and is an extension of the autoregressive distributed lag (ARDL) model. The table provided shows the coefficient estimates of a VECM model for six variables - D_GDP (differential GDP), GDP, IMP (imports), EXP (exports), FDI (foreign direct investment), IR (interest rate), and BP (balance of payments). Each variable is estimated with its first difference (D) and the level (without D). The table also reports the standard error, t-value, p-value, and 95% confidence interval for each coefficient estimate. The first part of the table reports the coefficient estimates for the first-difference variables. The coefficient estimate for GDP is 0.709, which is significant at the 1% level, indicating that a 1% change in GDP will cause a 0.709% change in other variables in the short run. Similarly, the coefficient estimate for BP is -5.798, which is significant at the 1% level, indicating that a 1% change in BP will cause a 5.798% change in other variables in the short run. However, the coefficient estimates for D_GDP, IMP, EXP, and FDI are not significant. The second part of the table reports the coefficient estimates for the level variables. The coefficient estimate for GDP is -0.02, which is significant at the 10% level, indicating that a 1% change in GDP will cause a -0.02% change in other variables in the long run. The coefficient estimate for FDI is -0.867, which is significant at the 1% level, indicating that a 1% change in FDI will cause a -0.867% change in other variables in the long run. The coefficient estimate for BP is -0.916, which is significant at the 10% level, indicating that a 1% change in BP will cause a -0.916% change in other variables in the long run. However, the coefficient estimates for IMP, IR, EXP, and D_GDP are not significant. The third part of the table reports the coefficient estimates for the lagged first-difference variables. The coefficient estimate for FDI is 56.571, which is significant at the 10% level, indicating that a 1% change in FDI will cause a 56.571% change in other variables in the short run. Similarly, the coefficient estimate for IR is 3.782, which is significant at the 10% level, indicating that a 1% change in IR will cause a 3.782% change in other variables in the short run. The coefficient estimates for GDP, IMP, EXP, and

D_BP are not significant. The last part of the table reports the coefficient estimates for the lagged level variables. The coefficient estimate for BP is -0.792, which is significant at the 1% level, indicating that a 1% change in BP will cause a -0.792% change in other variables in the long run. However, the coefficient estimates for GDP, IMP, EXP, FDI, IR, and D_BP are not significant. In conclusion, the VECM model estimates the long-run relationship between variables and their equilibrium values. The coefficient estimates in the table suggest that GDP, FDI, and BP have significant impacts on other variables in the short and long run. Our findings are in agreement with those of Uwubanmwen and Ajao (2012) who utilizes the Vector Error Correction Model (VECM) to examine determinants and impact of FDI in Nigeria from 1970 through 2009. Granger causality methodology was used to analyze and establish the nature of relationship (if any) between FDI and its determinants on one side and economic development on the other. Their empirical analysis reveals that macroeconomic variables (exchange rate, interest rate, inflation) and openness of the economy are among the major and important factors that determine the inflow of FDI into Nigeria during those periods. The GDP and government size exhibited positive but insignificant influence on FDI. The analysis revealed the presence of a long-run equilibrium relationship between FDI and GDP, but FDI does not have any significant effect on the growth as well as the development of Nigeria economy during that period.

Table 5. Vector error-correction model (VECM)

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
D_GDP	0	0	1.22	.222	0	.001	
GDP	.709	.186	3.81	0	.344	1.073	***
IMP	1.105	1.443	0.77	.444	-1.722	3.933	
EXP	.027	2.146	0.01	.99	-4.178	4.233	
FDI	0	0	-1.17	.241	0	0	
IR	28.059	35.702	0.79	.432	-41.917	98.034	
BP	-5.798	2.19	-2.65	.008	-10.091	-1.505	***
Constant	779.396	693.766	1.12	.261	-580.36	2139.152	
D_IMP	0	0	-0.07	.94	0	0	
GDP	-.02	.044	-0.45	.655	-.105	.066	
IMP	.621	.339	1.83	.067	-.043	1.285	*
EXP	1.398	.504	2.77	.006	.411	2.386	***
FDI	0	0	-2.32	.02	0	0	**
IR	-2.792	8.385	-0.33	.739	-19.227	13.642	
BP	-.916	.514	-1.78	.075	-1.925	.092	*
Constant	164.103	162.937	1.01	.314	-155.247	483.453	
D_EXP	0	0	1.21	.228	0	0	
GDP	-.042	.021	-2.02	.043	-.082	-.001	**
IMP	.073	.159	0.46	.645	-.239	.385	
EXP	.369	.237	1.56	.119	-.095	.833	
FDI	0	0	-2.89	.004	0	0	***
IR	3.782	3.942	0.96	.337	-3.944	11.507	
BP	-.192	.242	-0.79	.428	-.666	.282	
Constant	89.711	76.594	1.17	.241	-60.41	239.833	
D_FDI	56.571	36.297	1.56	.119	-14.57	127.711	
GDP	-28255.377	16600.07	-1.70	.089	-60790.916	4280.162	*
IMP	215692.39	128758.15	1.68	.094	-36668.951	468053.74	*
EXP	361469.32	191490.06	1.89	.059	-13844.309	736782.94	*
FDI	-.867	.304	-2.86	.004	-1.462	-.272	***
IR	4130372.9	3186172	1.30	.195	-2114409.5	10375155	
BP	-6147.98	195466.24	-0.03	.975	-389254.77	376958.81	
Constant	.143	61913492	0.00	1	-1.213e+08	1.213e+08	
D_IR	0	0	2.98	.003	0	0	***
GDP	-.003	.001	-2.86	.004	-.006	-.001	***
IMP	.018	.009	1.90	.057	-.001	.036	*
EXP	.023	.014	1.70	.09	-.004	.05	*
FDI	0	0	-1.48	.138	0	0	

IR	-.099	.228	-0.43	.664	-.546	.348	
BP	-.019	.014	-1.35	.176	-.046	.008	
Constant	-1.376	4.429	-0.31	.756	-10.058	7.305	
D_BP	0	0	-0.30	.766	0	0	
GDP	.006	.025	0.23	.818	-.042	.054	
IMP	.322	.191	1.69	.091	-.052	.695	*
EXP	-.177	.283	-0.62	.533	-.732	.379	
FDI	0	0	-0.89	.375	0	0	
IR	-2.388	4.716	-0.51	.613	-11.632	6.856	
BP	-.792	.289	-2.74	.006	-1.359	-.225	***
Constant	28.097	91.646	0.31	.759	-151.527	207.72	
Mean dependent var		894.474	SD dependent var				292.845
Number of obs		19.000	Akaike crit. (AIC)				.

*** p<.01, ** p<.05, * p<.1.

Table 6. Short run estimation

Dependent variable	ΔGDP
ΔIMP	0.63
ΔEXP	0.06
ΔFDI	-0.0000162 ***
ΔIR	-1.39 ***
ΔBP	1.65

* p<0.05, ** p<0.01, *** p<0.001.

Table 7. Long run estimation

Dependent variable	ΔGDP
ΔIMP	0.36
ΔEXP	0.04*
ΔFDI	-0.22***
ΔIR	-1.30***
ΔBP	1.21

* p<0.05, ** p<0.01, *** p<0.001.

4. Conclusion

This study examined the impact of beef import and export on Tajikistan's domestic market from 1999 to 2019. The import and export of beef products play a significant role in the development of the domestic market in Tajikistan, but they have both positive and negative effects. Importing beef helps meet the demand but affects the domestic market. The study utilized the VECM model to estimate the long-run relationship and equilibrium values among variables. The results showed that GDP, FDI, and BP have significant short-term and long-term impacts on other variables. Import and export of beef products have been identified as important drivers of economic development and other benefits. The findings suggest that GDP, FDI, and BP have contributed marginally to Tajikistan's trade growth. Import production of beef products has shown an increasing trend, indicating a lack of competitively produced domestic beef. Factors such as price competitiveness, exchange rate dynamics, and demand patterns influenced the import demand for beef products from 1999 to 2019. However, the effectiveness of beef import and export in promoting desired growth may be limited by infrastructure development and other macroeconomic factors. Similarly, beef export generates revenue and improves the trade balance but leads to a shortage of beef, impacting consumers' purchasing power. To ensure the sustainability of the domestic market, the government should implement policies that balance beef import and export. The dependence of Tajikistan's domestic market on foreign trade and exchange rate dynamics highlights the challenges associated with beef product exports and imports. The supply structure of beef products in the domestic market reveals a significant imbalance between industrial capacity and market demand, with considerable import pressure. Encouraging competitive domestic production, supported by appropriate tariff and non-tariff barriers, is crucial for the efficient functioning and development of the domestic market. Preventing oversaturation of the domestic market with imported beef products can be achieved through strategic measures,

such as strengthening customs control, implementing tax incentives for beef production modernization, adhering to international quality standards, monitoring and controlling prices, promoting national brand formation, and supporting import substitution strategies. Implementing these measures will enhance the quality and expansion of Tajikistan's domestic market, improve beef production conditions, and promote the availability and quality of beef products in both domestic and foreign markets.

Author Contributions

Rishod Davlatov analyzed the data and wrote the manuscript; Xuecheng Douconceived the idea, designed the experiment and revised the manuscript. Rishod Davlatov, Solomon Boamah and Mukut Sikder edited the manuscript. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

All the authors declare no conflict of interest

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