# IMPACT OF SAUDI'S MEMBERSHIP IN GLOBAL AND ARAB ECONOMIC BLOCS ON ITS AGRICULTURAL FOREIGN TRADE

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## ABSTRACT

In recent years, the world has witnessed many changes in international economic relations, and the global system has crystallized into major economic blocs aimed at strengthening the position of these blocs in the framework of global international trade and economic stability. Accordingly, the research aims to study the impact of the accession of the Kingdom of Saudi Arabia to the membership of some economic blocs on Saudi agricultural foreign trade during the time period (1995-2019). By depend on both descriptive and quantitative statistical analysis. To study the evolution of the value of agricultural exports and imports and the most important factors affecting each of them, used of some indicators of export competitiveness such as a measure of geographical and commodity concentration. Also used the simultaneous equations method to build an econometric model to analyze the structure of agricultural foreign trade and its estimation by Two-Stage least squares (2SLS) method, the paper predicts the future of Saudi agricultural foreign trade. The research relied on secondary data. The results of the study expect that the average per capita share of agricultural exports, imports and agricultural Balance Deficit will reach about 600, 3.600 and 2.900 thousand riyals, respectively, during the year 2026.

**Contribution/ Originality:** This study is a complement to previous studies, a good estimation methodology using simultaneous equation method used to estimate an econometric model for Saudi agricultural foreign trade. It is one of a few studies that investigated the impact of the Kingdom's accession to economic blocs on the agricultural foreign trade.

## 1. INTRODUCTION

The global economy is witnessing rapid developments and transformations since the last decade of the twentieth century, where many fundamental changes have taken place, the most important of which is the liberalization of global trade and the emergence of economic cartels, most of which emerged in the era of the nineties. This contributed to the emergence of international competition, especially in the commercial sector, as trade is one of the most important factors leading to economic growth. The emergence of economic clusters, the

removal of custom and non-custom fees of exports and imports, and the erosion of geographical borders, provided the comparative advantage for the member states of cartels (Hamza, 2015).

Due to the increase in the size of economic cartels and the expansion of their influence, foreign trade has increased significantly. Therefore, most countries have been interested in establishing economic blocs to achieve economic growth on the one hand, and strengthen their position and impose their domination and power on the other hand. Where there is no place in the world for non-integrated and economically agglomerated countries, the economic growth of the country depends greatly on the economic conditions and conditions of the rest of the member states of the cartels. The most important economic cartels to which the Kingdom of Saudi Arabia has joined are: the World Trade Organization (WTO), the Greater Arab Free Trade Area (GAFTA), the Arab Gulf Cooperation Council and others (Shehab, 2013).

The foreign trade of the Kingdom of Saudi Arabia has developed remarkably along with the global development, which used to generate revenues from seasonal trade such as Hajj and Umrah. Now, after the huge industrial renaissance that the Kingdom witnessed, its revenues increased and the value of its exports increased dramatically, with the total value of exports amounting to about 981 billion riyals during the year 2019, representing about 33% of the Saudi gross domestic product, which amounts to about 2,974 billion riyals. The total value of imports amounted to about 574 billion riyals. Petroleum materials ranked first in exports, amounting to about 752 billion riyals, representing about 77% of the total value of total exports, and at the level of the agricultural sector, the value of agricultural exports amounted to about 12 billion riyals, representing about 1.26% of the total exports. As for agricultural imports, they amounted to about 69 billion riyals, representing about 12.02% of the total value of total imports, which means that the value of agricultural imports has increased by nearly six times over agricultural exports for the same year (General Authority for Statistics, 2019).

A. The problem of the study is that although the Kingdom's total exports are greater than its imports, there is a surplus in the overall trade balance; most of the Kingdom's exports are based on primary petroleum products only, at a rate of about 77%. As for agricultural exports, they represent a very small percentage of total exports by no more than 1.26%. The value of Saudi agricultural imports increased by about six times the value of their agricultural exports, which causes a deficit in the agricultural trade balance.

B. This is important for conducting the research as an attempt to find out the impact of the Kingdom of Saudi Arabia's accession to some global and Arab economic cartels on Saudi agricultural foreign trade, as well as knowledge of the Kingdom's most important trading partners for the agricultural sector. This helps re-evaluate and direct Saudi Arabia's agricultural exports and imports in a manner that achieves the maximum possible economic benefits.

C. The study mainly aims to analyze the structure of Saudi agricultural foreign trade by studying both Saudi agricultural exports and imports to determine the causes of the deficit in the agricultural trade balance. In addition, the paper will study the geographical and commodity distribution of agricultural commodities with the aim of identifying changes in the structure of Saudi agricultural foreign trade since it is a member of the World Trade Organization, the Gulf Cooperation Council, and the Greater Arab Free Trade Zone. Membership in the mentioned organization may affect the value of both agricultural exports and imports. Also, the paper aims to unveil the following sub-objectives:

D. The development of the Kingdom's total and agricultural exports and imports and the most important factors affecting it during the period (1995 − 2019).

E. Geographical and commodity distribution of the Kingdom's agricultural exports and imports for the period (2013 − 2019).

F. Building a simultaneous econometric model to analyze the structure of Saudi agricultural foreign trade during the period (1995 − 2019).

G. Predicting the value of agricultural exports and imports until 2026.

## 2. LITERATURE REVIEW

Al-Yousif (1997) studied the relationship between exports and economic growth four Arab Gulf countries, which are Saudi Arabia, Kuwait, the United Arab Emirates and Oman during the period (1993-1973). The study relied on a quantitative economic approach using trend equations, the simultaneous standard model, and some statistical tests such as unit roots test, and counteraction tests. The results show that there is a direct relationship between each of the two variables, exports and economic growth, noting that most of the exports of these countries used as a sample in the study depend on oil and use oil revenues to purchase and import almost all their consumption needs. At the same time, there are efforts made by the Arab Gulf countries to diversify their local economy. The study recommends the necessity of following up on these efforts to reach a diversified commercial structure.

Diao, Somwaru, and Roe (2001) analyzed the agricultural trade of WTO member countries using general equilibrium model by focusing on the agricultural negotiations conducted within the framework of the WTO, which included a set of reforms represented in various forms such as domestic subsidies, import tariffs and export subsidies. The study showed that free trade leads to expansion and an increase in the volume of trade, and agricultural production in developed countries is much lower than that in developing countries. This is because agricultural support and protection rates are higher in some developed countries than in developing countries. In developing countries, the study indicated that the liberalization of agriculture around the world will lead to a rise in world prices. Also, import tariffs are the main reason for the decline in world agricultural prices, and that their abolition will lead to a rise in world agricultural prices by about six percent due to the different levels of protection and patterns of trade among countries. In addition, some developing countries are witnessing a greater increase in the prices of imported goods compared to the increase in the prices of exports. These negative trade conditions may lead to the exposure of these developing countries and some members of the trade bloc to welfare losses because they will suffer from reduced demand for the goods they export to the former member states, while the global demand for the goods they import will rise. However, the long-term gains are greater than the short-term gains for most of the world.

Ramady and Mansour (2006) studied the effects of Saudi Arabia's membership in the World Trade Organization on the local economy, especially on some major industries, based on the method of descriptive analysis. The study found that this accession will create opportunities for some sectors and a threat to others because this membership will entail reorganization and restructuring each of the national economy, Saudi institutions, and the main production and service sectors. The study confirmed that dealing with membership with a highly efficient and effective administration will have an important role in reviving the private sector and integrating the Saudi market system.

Boughanmi (2008) examined the real trade potentials of the Gulf Cooperation Council countries. The study aimed to verify the belief that trade among the countries of the Middle East and North Africa is small and limited based on the method of Gravity model. The results showed that there is a dense intra-regional trade between the countries of the Gulf Cooperation Council without a major commercial transfer because of trade openness of the Gulf Cooperation Council countries compared to other trade agreements in the Middle East and North Africa. The results also showed that the intra-regional trade of the GCC countries and the East Asian countries are more than expected. Conversely, it is less than expected with the Arab Maghreb countries, despite the activation of the GAFTA. Also, it was found that there is big trade between the GCC countries, the European Union and the United States despite of no legal trade agreements between the GCC countries and both blocs during the time period used in the analysis (1990-2004).

Grant and Lambert (2008) conducted a study looking at whether regional trade agreements lead to increased agricultural trade for member countries. The study indicated that the level of protection in the agricultural sector is much higher than in other sectors, and this causes a block on the agricultural foreign trade depending on the rates

of economic attractiveness as a research method. The study found that the regional trade agreements provide an opportunity to liberalize agricultural trade for member countries and increase their trade in contrast with the GATT/WTO Agreement, which did not make significant progress in liberalizing agricultural trade. The study recommended the need to pay attention to the effects of regional trade agreements on some agricultural commodities.

Cadot, Olarreaga, and Tschopp (2009) conducted a study to find out the impact of trade agreements on fluctuations in agricultural trade policy since it has negative effects on investment and economic growth. The study used simple linear regression method. The main results indicated that the regional trade agreements have demonstrated remarkable stability in agricultural trade policy. As for the agricultural WTO agreements, they have contributed by reducing the volatility of agricultural trade policy.

Afesorgbor and Van Bergeijk (2014) measured the impact of multiple membership in economic integration on trade by comparing two major economic blocs of African countries, which are the Economic Community of West African States (ECOWAS) and the Southern African Development Community (SADC). The authors relied on the method of the gravity model analysis. The study found that the effect of multiple memberships has a positive effect if the additional membership complements the economic integration initiative.

Ganguli (2016) studied the possibility of achieving an economic and monetary union for the GCC countries, based on the experience of the European Monetary Union, using the method of the indicators of economic efficiency analyses. The results of the study found that there is a structural and economic similarity between the GCC countries in terms of sustainable growth, price stability and exchange rate stability. Although, the dependence on oil in the composition of the GDP of the Gulf Cooperation Council countries and the lack of diversification in oil-related products leads to significant risks to the potential monetary union. This may lead to fiscal deficit in GDP during the period of low oil prices. Thus, the study recommends that economic diversification and to reduce dependence on oil to achieve to the monetary union.

Flach and Gräf (2018) studied the impact of trade agreements on export prices for all countries and for all different industrial products depending on the relationship between the member states of the WTO and the global export prices for different goods using the method of the indicators of economic efficiency. The results showed that the multilateral investment trade agreements are linked to the rise in global export prices since these agreements reduce trade restrictions in front of imported goods. This leads to creating an atmosphere of competition to obtain better quality products. In addition, this may lead to a rise in international export prices.

Saberi and Hamdan (2019) researched for the real role played by all the governments of the six GCC countries to achieve a balance in the relationship between entrepreneurship and economic growth based on the method of the quantitative economic analyses, and some of the indicators of economic efficiency. The results showed that the governmental support in GCC countries for entrepreneurs has a moderate and significant impact on the relationship between entrepreneurship and economic growth. The results also showed that one of the strongest investment indicators in the Gulf is capital risk. This shows the reason for the rapid growth in investment contracting. Conversely, the least investment indicators in the Gulf are technology and innovation. The study recommends that entrepreneurship efforts should enhance economic growth and diversify the local economy of the GCC countries, and should take the advantage of governmental support, especially by focusing on quality.

## 3. RESEARCH METHODS AND MATERIALS

To achieve the paper's objectives, the study relied on descriptive and quantitative statistical approach using specialized statistical software such as SPSS and Excel to study the development of the value of both total and agricultural exports and imports of Saudi Arabia. The use of some economic indicators such as the coverage rate, the degree of economic exposure, the degree of economic participation, the rate of trade exchange and finally geographical and commodity concentration scale of agricultural commodities in the Kingdom, In addition to using

the simultaneous equations method to construct an econometric model for agricultural foreign trade and estimate it by the two-stage least squares method (2SLS), the research relied on secondary data related to the subject of the study during the period (1995-2019). The data obtained from the Saudi General Authority for Statistics, the Central Bank of Saudi Arabia and the Food and Agriculture Organization (FAO).

## 4. RESUITS AND DISCUSSION

### 4.1. A Study of the Development of the Overall Trade and Agricultural Balance of the Kingdom during the Period (1995 – 2019)

#### 4.1.1. Evolution of the Total Saudi Exports

The paper estimates the general temporal trend for the development of the value of total exports during the period (1995-2019). Table 1 indicates that the value of total exports increased by a statistically significant amount of about 46 billion riyals annually at an annual growth rate of about 6.57% of its average value of about 707 billion SAR during the period (1995-2019). It is clear from the value of the coefficient of determination (R²) that about 63% of the changes in the value of Saudi exports are due to the change in the time variable.

#### 4.1.2. The Evolution of the Total Import Value of Saudi Arabia

Time trend of the development of the value of total imports during the period (1995-2019) is shown in Table 1, which indicates an increase in the value of total imports by a statistically significant amount of about 26 billion riyals annually, with an annual growth rate of about 7.78% of its average of about 335 billion riyals during (1995-2019). It is evident from the value of the coefficient of determination (R²) that about 86% of the changes in the value of Saudi imports are due to the change in the time variable.

The time trend in Table 1 indicates an increase in the surplus in the Saudi trade balance by a statistically significant amount of about 20 billion riyals annually, at an annual growth rate of about 5.49% of the average of about 573 billion riyals during the period (1995-2019).

In examining the evolution of the extent to which total exports represent total imports during the same period. The results of the overall time trend showed a relatively stable proportion of total export coverage of total imports. It showed a time trend of a statistically insignificant decline of about 1.13. This means the relative stability of the coverage of Saudi total exports and Saudi total imports. This is an average of about 217% during the period (1995-2019).

#### 4.1.3. The Development of the Value of Saudi Agricultural Exports

The overall time trend for the development of the value of agricultural exports during the period (1995-2019) in the same Table 1 indicate that the value of agricultural exports increased by a statistically significant amount of about 0.65 billion riyals per year. At an annual growth rate of about 8.92% of its average. About 7 billion riyals during the period (1995- 2019), the value of the coefficient of determination (R²) shows that about 89% of the changes in the value of Saudi agricultural exports are due to the change in the time variable.

#### 4.1.4. The Development of the Value of Saudi Agricultural Imports

The general time trend for the development of the value of agricultural imports during the period (1995-2019) in Table 1 indicates that the value of agricultural imports increased by a statistically significant amount of about 3 billion riyals per year and at a growth rate of about 7% from an average of about 47 billion riyals during the period (1995-2019). The value of the coefficient of determination (R²) shows that about 85% of changes in the value of Saudi agricultural imports are due to the change in time variable.

**Table-1.** General time trends for trade and agricultural balance components during the period (2019-1995).

| Equation Number | Phenomenon | Equation of the general trend | T | F | R² | Average | Annual % change | Significant |
|---|---|---|---|---|---|---|---|---|
| 1- | total exports | $Y_1=102.98+46.49X$ | 6.28 | 39.41 | 0.63 | 707.39 | 6.57 | * |
| 2- | Total imports | $Y_2=-3.88+26.04X$ | 11.96 | 143.09 | 0.86 | 334.62 | 7.78 | * |
| 3- | General trade balance | $Y_3=106.86+20.45X$ | 3.27 | 10.71 | 0.32 | 372.76 | 5.49 | * |
| 4- | Agricultural exports | $Y_4=-1.15+0.65X$ | 13.34 | 177.91 | 0.89 | 7.29 | 8.92 | * |
| 5- | Agricultural imports | $Y_5=2.46+3.42X$ | 11.37 | 129.34 | 0.85 | 47.34 | 7.28 | * |
| 6- | Agricultural balance | $Y_6=-3.60-2.77X$ | -10.78 | 116.26 | 0.83 | -39.68 | 6.98 | * |
| 7- | Total export coverage for total imports | $Y_7=231.73-1.13X$ | -0.79 | 0.63 | 0.03 | 217.04 | -0.52 | - |
| 8- | Agricultural export coverage ratio Agricultural imports | $Y_8=8.58+0.42X$ | 6.7 | 44.91 | 0.66 | 13.99 | 3 | * |

**Where:** x Time Period (1995-2019) (*) refers to significant regression coefficient and (-) indicates insignificant regression coefficient.

Table 1 time trend estimates that the agricultural deficit increased by a statistically significant amount of about 3 billion riyals and an annual growth rate of about 7% from the average of about 40 billion riyals during the period (1995-2019).

In examining the evolution of the proportion of agricultural exports represented by agricultural imports during the same period prior, the results of the general time trend showed a relatively statistically significant higher increase in the proportion of Saudi agricultural exports coverage of agricultural imports at an annual growth rate of about 3% of the average of about 14%.

*4.2. The Development of the Most Important Indicators of Export Competitiveness of the Agricultural Foreign Trade Structure during the Period (1995-2019).*
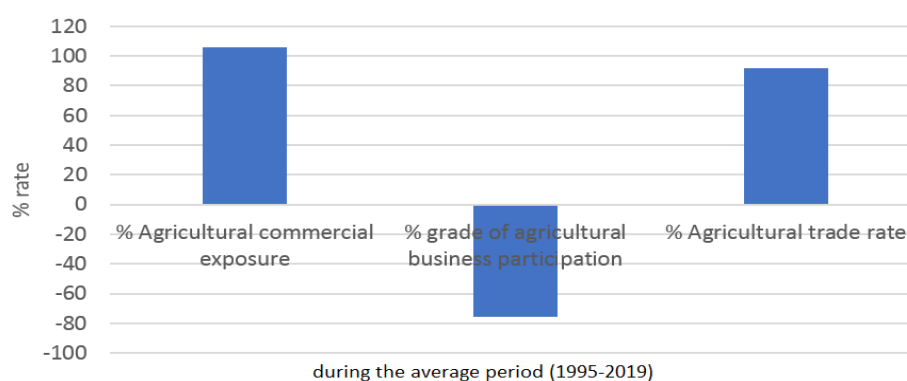


**Figure-1.** The development of the most important indicators of export competitiveness of Saudi and agricultural foreign trade during the period (1995-2019).

Figure 1 shows that the average degree of agricultural trade exposure represents about 106% during the study period, which indicates an increased degree of risk and the impact of the kingdom's agricultural economy on fluctuations in the world markets. Due to the correlation between the rate of growth of agricultural GDP and changes in international trade, as the Kingdom depends on imports to collect most of its agricultural products, and the average degree of agricultural trade participation achieved a decrease of about 76% during the study period,

which indicates the lack of contribution and participation of agricultural sector in international trade. Also, the average rate of agricultural trade represents about 92% during the study period, which shows the ratio of the dependence of gross domestic product (GDP) on agricultural imports and shows that the Kingdom depends heavily on agricultural imports in collecting its gross domestic product, which account for about four times the value of agricultural exports.

*4.3. Geographical and Commodity Distribution of Saudi Agricultural Exports and Imports during (2019-2013)*

*4.3.1. The Geographical Distribution of Saudi Agricultural Exports and Imports during (2019-2013)*

Through Figure 2 and Table C in the appendix, the results of the distribution and geographical concentration of Saudi agricultural trade have shown the trend of agricultural exports to be concentrated in the GCC countries and the trend of agricultural imports to be concentrated with the EU countries. The geographical concentration coefficient was calculated using the Hirschman index, which shows a strong geographical concentration of agricultural exports in the GCC, as well as in other Arab countries. There is a strong geographical concentration of Saudi Arabia's imports from EU countries. This disrupts the geographical distribution of Saudi agricultural trade, which will increase Saudi national economic dependency on fluctuations in the economies of these countries.
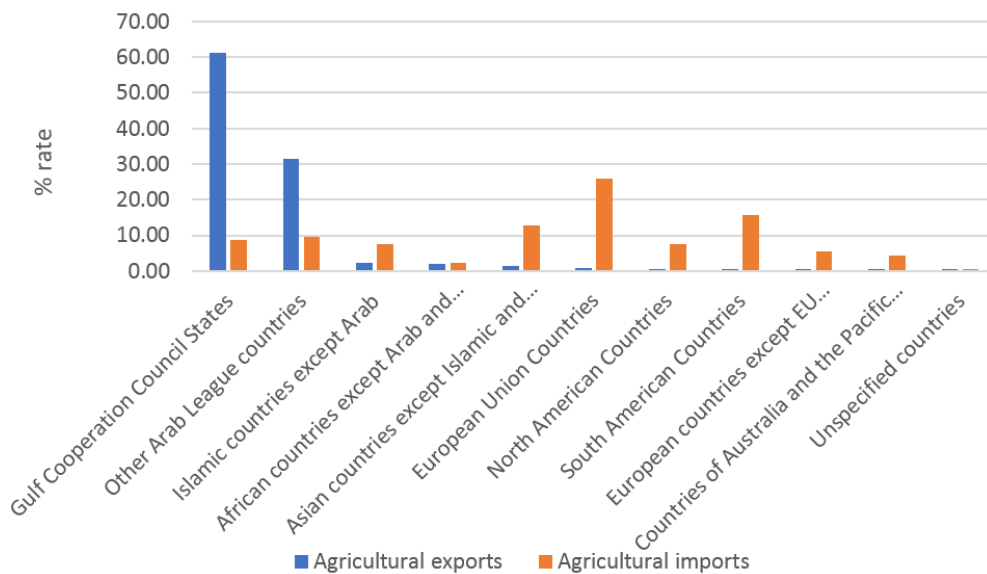


**Figure-2.** Geographical distribution of agricultural exports and imports during the average period (2013-2019).

*4.3.2. Commodity Distribution of Saudi Agricultural Exports and Imports during the Average Period of (2013-2019).*

The commodity composition of Saudi agricultural exports and imports contains a number of commodity groups, the most important of which are dairy products, eggs, fruits, vegetables, fresh, chilled and frozen meat, as well as other agricultural goods and products. Through Figure 3 and Table D in the appendix, it is clear from the results of the distribution and commodity concentration of the Kingdom's agricultural foreign trade that Saudi Arabia is an importer of food, which may be due to the increasing number of populations and the inability of domestic production to meet domestic demand for food. This leads to reliance on imports, thereby increasing Saudi Arabia economic and political dependency on other countries and price volatility that occurs there.

Most of Saudi agricultural imports of food commodities have been centered on certain goods. The cereal group ranked first, followed by the fruit and vegetable group. Third place is fresh, chilled and frozen meat. Hirschman's commodity concentration coefficient was calculated and the results showed that there was no commodity concentration on all the Agricultural exports and imports of the Kingdom during the study period.
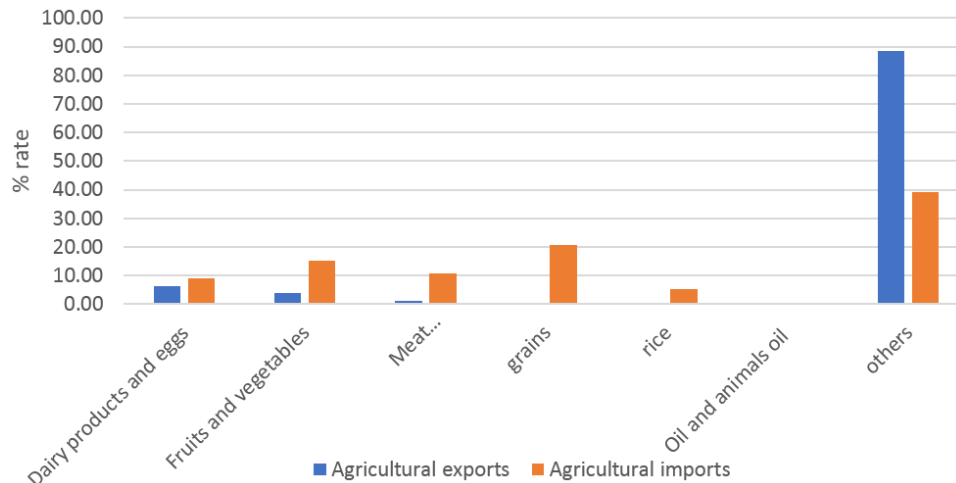
**Figure-3.** Commodity distribution of Saudi agricultural exports and imports during the period (2013-2019).

### 4.4. Statistical Estimate of the Simultaneous Econometric Model of the Variables of Saudi Agricultural Foreign Trade during the Period (1995-2019) Using Single-Equation Models

**S**audi Arabia's agricultural trade balance consists of two aspects: agricultural exports (representing the demand) and agricultural imports (representing the supply), so the study estimated each side statistically by using single-equivalent models, i.e., OLS. It is the most commonly used method in this case because it is characterized by the fact that it minimizes random error.

### 4.4.1. Agricultural Export Function

Based on previous studies and economic theory, the study assumed some variables that were likely to affect agricultural exports during the period (1995-2019). These are the average per capita value of agricultural investment (SR/capita), average per capita value of agricultural GDP (SR/capita), average per capita agricultural export price (SR/ capita), foreign exchange reserves (SR/capita), and exchange rate (SR/capita). In addition to a qualitative variable that reflects the impact of activating Saudi Arabia's entry into the World Trade Organization in 2006, another variable reflects the impact of Saudi Arabia's accession to the Greater Arab Free Trade Area in 2005, and the third reflects the impact of Saudi Arabia's accession to the Gulf Cooperation Council (GCC) in 2002 as well as time trend during the period (1995-2019). The best results were chosen based on their agreement with both economic logic and statistical significance. Also, the best variables were identified using the simple correlation matrix.

The demand side of the Saudi agricultural trade balance includes one key relationship: export function.

$$\hat{Y}_{1t}=-538.08+3.069X_{1t-1}+137.45D_3$$

(6.90)      (4.45)

$R^2=0.86$      $F=68.42$

Where:

$\hat{Y}_{1t}$ = average per capita value of estimated agricultural exports for the year t (SR/capita) $X_{1t}$ = average per capita agricultural investment value for the previous year t-1 (SR/capita).

$D_3$ = Dummy variable reflecting the impact of activating Saudi Arabia's accession to the Gulf Cooperation Council, where it takes the value (zero) for the period (1995-2001) and the value (1) for the period (2019-2002).

The results of the previous equation show that the value of the average per capita agricultural exports increases by 3 (SR/capita) per year in the average value of agricultural investment for the previous year by the unit (SR/capita). The value of the average per capita agricultural exports for the period of activation of the GCC agreement increased compared to the period before activation, by an average of about 137 (SR/ capita). This reflects the positive impact of the activation of that convention on average per capita agricultural exports, and has proved

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statistical significance at the five percent level. Also, the f-statistics show the model as a whole is significant. It $R^2$ shows that about 86% of the changes in the average per capita value of agricultural exports are due to the change in the independent variables studied.

### 4.4.2. Agricultural Import Function

Based on previous studies and economic theory, the study assumed some variables that were likely to affect agricultural imports during the period (1995-2019). These variables are average per capita value of agricultural GDP (SR/per capita), foreign exchange reserves (SR/capita), and exchange rate (SR/capita). In addition to a qualitative variable that reflects the impact of the activation of Saudi Arabia's accession agreement to the World Trade Organization in 2006. The third variable reflects the impact of the activation of Saudi Arabia's accession agreement to the Gulf Cooperation Council (GCC) in 2002 and the change of time during the period (1995-2019). The best results were chosen based on their agreement with both economic logic and statistical significance, and the best variables were identified using the simple correlation matrix.

The supply side of the Saudi agricultural trade balance includes one main relationship: import function and it can be explained in the following equation:

$\hat{Y}_{2t} = -2323.04 + 28.813X_{2t} - 179.27D_3$

$(9.19) \quad (-0.969)$

$R^2 = 0.89 \quad F = 87.8$

Where:

$\hat{Y}_{2t}$ = average per capita value of estimated agricultural imports for the year t (SR/ capita).

$X_{2t}$ = average per capita agricultural consumption value for the year t (SR/ capita).

$D_3$ = Dummy variable reflecting the impact of activating Saudi Arabia's accession to the GULF Cooperation Council, where it takes the value (zero) for the period (1995-2001) and the value (1) for the period (2002-2019).

The results of the previous equation show that the average per capita value of agricultural imports increases by 29 (SR/capita) per year increase in the average value of agricultural consumption for the same year by the unit (SR/capita).

The value of the average per capita agricultural imports decreased by about 179 riyals/individual, as the average period of activation of the GCC agreement compared to the period before activation, reflecting the positive impact of the activation of that agreement in the decline in the average per capita agricultural imports, i.e., the GCC agreement favors Saudi agricultural imports. Although most agricultural imports are food commodities and the effect of activating the GCC agreement is statistically insignificant, which indicates that per capita agricultural imports have not yet been affected by the activation of that agreement. This shows that the agricultural import sector has not yet interacted with the GCC Agreement, and the significance of the model as a whole has been achieved and that about 89% of the changes in average per capita agricultural imports are due to the change in the independent variables under study.

### 4.5. Statistical Estimate of the Simultaneous Economic Model of the Variables of Saudi Agricultural Foreign Trade during the Period (1995-2019) Using Multi-Equation Models

In this study, the most important variables of Saudi agricultural foreign trade were used according to the matrix of simple correlation analysis to help determine the best mathematical form to be used in statistical analysis, thereby determining the degree of definition of the model and then the optimal method of estimation. We use the average per capita agricultural variables based on statistical economic and significance logic criteria. It also ensures that the time chains of all agricultural variables are stable in order to ensure the accuracy of the estimates obtained and then be able to rely on them for later forecasting.

The most important economic relations of Saudi Arabia's agricultural foreign trade model could be determined by the agricultural trade balance, which in turn consists of three main relationships.

### 4.5.1. Demand Function

The demand side of the Saudi trade balance includes one key element: The Agricultural Export Function and it can be explained in the following equation:

$\hat{Y}_{1t} = F(X_{1t-1}, \hat{Y}_{2t}, D_3)$

Where:

$\hat{Y}_{1t}$ = average per capita value of estimated agricultural exports for the year t (SR/capita).

$X_{1t-1}$ = average per capita agricultural investment for the previous year t-1 (SR/capita).

$\hat{Y}_{2t}$ = average per capita value of estimated agricultural imports for the year t (SR/capita).

$D_3$ = a dummy variable that reflects the impact of activating Saudi Arabia's accession to the Gulf Cooperation Council, taking the value (zero) for the period (1995-2001) and the value (1) for the period (2002-2019).

### 4.5.2. Supply Function

The supply side of the Saudi trade balance includes one major relationship; The Agricultural Import Function and it can be explained in the following equation:

$\hat{Y}_{2t} = F(X_{2t}, \hat{Y}_{1t}, D_3)$

Where:

$\hat{Y}_{2t}$ = average per capita value of estimated agricultural imports for the year t (SR/capita).

$X_{3t}$ = average per capita agricultural consumption value for the year t (SR/capita).

$\hat{Y}_{1t}$ = average per capita value of estimated agricultural exports for the year t (SR/capita).

$D_3$ = a dummy variable that reflects the impact of activating Saudi Arabia's accession to the Gulf Cooperation Council, taking the value (zero) for the period (1995-2001) and the value (1) for the period (2002-2019).

### 4.5.3. Equilibrium Function

This is the function that includes both sides of the Saudi agricultural trade balance to explain the surplus or deficit in it. (The agricultural Trade balance Function).

It consists of one main relationship that can be explained in the following equation:

$Y_{3t} = F(Y_{1t}, Y_{2t})$

$\hat{Y}_{3t} = F(Y_{2t}, D_3)$

Where:

$\hat{Y}_{3t}$ = average per capita value of Saudi agricultural trade balance (SR/capita).

$\hat{Y}_{2t}$ = average per capita value of estimated agricultural imports for the year t (SR/capita).

$D_3$ = a dummy variable that reflects the impact of activating Saudi Arabia's accession to the Gulf Cooperation Council, taking the value (zero) for the period (1995-2001) and the value (1) for the period (2002-2019).

### 4.6. Types of Variables within the Form

The previous model includes two sections of variables.

### 4.6.1. Endogenous Variables

These variables affect and influence the model, and their value is determined from within the model by transactions and the values of external variables and these internal variables are called dependent variables including:

$\hat{Y}_{1t}$ = average per capita estimated agricultural exports for the year t (SR/capita).

$\hat{Y}_{2t}$ = average per capita estimated agricultural imports for the year t (SR/ capita).

$\hat{Y}_{3t}$ = average per capita value of Saudi agricultural trade balance estimated for the year t (SR/ capita).

### 4.6.2. Predetermined Variables

It is divided into two types of variables, Exogenous Variables their value is determined by factors outside the model. Sometimes their values are determined by another model different from the original model. The external variables are called independent variables as below, the second type Lagged Endogenous Variables are internal variables but belong to an earlier period of time, i.e., take their values from the previous period. The predetermined variables include:

$X_{1t}$ = average per capita agricultural investment value for the previous year t-1 (SR/ capita).

$X_{2t}$ = average per capita agricultural consumption value for the year t (SR/ capita).

$D_3$ = dummy variable reflecting the impact of activating Saudi Arabia's accession to the GULF Cooperation Council, where it takes the value (zero) for the period (1995-2001) and the value (1) for the period (2002-2019). The econometric model of Saudi agricultural foreign trade structure consists of three equations comprising agricultural exports to reflect the demand side and agricultural imports to reflect the supply side and then the equation of the Saudi agricultural trade balance, which in turn reflects the balance between the two sides (agricultural exports and agricultural imports).

### 4.7. Results of Statistical Estimate

It is clear from previous results that the model is over identified model and therefore the two stages (2SLS) method were the best methods to estimate the standard model of the Saudi agricultural foreign trade structure, where the results of the statistical analysis as follows:

### 4.7.1. Agricultural Export Equation

$\hat{Y}_{1t} = -293.65 + 1.379 \, X_{1t-1} + 0.105 \, \hat{Y}_{2t} + 80 \, D_3$

(1.62)          (2.27)    (2.11)

$R^2 = 0.89$      F=55.91

### 4.7.2. Equation of Agricultural Imports

$\hat{Y}_{2t} = -1492.28 + 19.909 \, X_{2t} + 2.108 \, \hat{Y}_{1t} - 297.90 \, D_3$

(3.15)    (1.61)      (-1.54)

$R^2 = 0.90$            F=63.64

### 4.7.3. Equation of Agricultural Trade Balance

$\hat{Y}_{3t} = -75.98 - 0.829 \, \hat{Y}_{2t} + 55.44 D_3$

 (-9.29)      (0.40)

$R^2 = 0.89$      F=84.44

The first equation shows that the average per capita value of agricultural exports increases by 1 (SR/capita) annually, in the average value of agricultural investment for the previous year by one unit (SR/capita). The average per capita value of agricultural exports increases by about 0.11 (SR/capita) per year, which was statistically confirmed by per capita increase in the value of agricultural imports estimated for the same year by (SR/capita), which means an increase in both agricultural exports and imports during the study period. This may be due to the policies of trade openness prevailing in the world adopted by the Kingdom. As shown by the statistically positive impact of the period of activation of the GCC agreement compared to the period before activation, the average per capita value of agricultural exports increased by about 80 (SR/capita). The significance of the model as a whole has

been shown and it is found that about 89% of the changes in the average per capita value of agricultural exports are due to the change in independent variables the study.

The second equation shows that the average per capita value of agricultural imports increases by 20 (SR/ capita) annually. It has been statistically confirmed for each increase in the average per capita value of agricultural consumption for the same year by unit (SR/capita). The average per capita value of agricultural imports increases by 2 (SR/capita) annually for each increase in the average per capita. The value of agricultural exports estimated for the same year by the unit (SR/capita), and the positive and desirable impact of the period of activation of the Gulf Cooperation Council agreement compared to the period before activation. The decrease in the average per capita share of agricultural imports reached an amount of about 298 (SR/ capita), although the effect of activating the Gulf Cooperation Council agreement is statistically insignificant, which indicates that the average per capita share of agricultural imports has not been affected by activating GCC agreement. Also, 90% of the changes in the average per capita share of agricultural imports are due to the change in the independent variables under study.

The third equation also shows that the average per capita value of the deficit in the Saudi agricultural trade balance decreases by 1 (SR/capita) annually. It has been statistically confirmed for each increase in the average per capita. The value of agricultural imports estimated for the same year by the unit (SR/capita), and in return the effect was shown the desired positive sign for the period of activation of the Gulf Cooperation Council agreement compared to the period before activation. It has increased in average per capita share of the deficit value in the agricultural trade balance by an amount of about 55 (SR/ capita). The value of the deficit in the agricultural trade balance is due to the change in the independent variables under study.

### 4.8. Predicting the Behavior of the Variables of the Simultaneous Model of the Agricultural Trade Balance Until 2026

Predicting the values of economic variables and phenomena is one of the most important objectives of the standard economy. It depends on quantifying the expected value of dependent variables in the near future based on the available information. Whether past or present, where scientific prediction assumes that the behavior of economic phenomena in the recent past extends to their behavior in the near future, and in the event of sudden changes that were not expected such as wars or epidemics could lead to an imbalance in the accuracy of economic phenomena in the near future.

**Table-2.** The results of the Thiel test of the Simultaneous model of the Saudi agricultural trade structure.

| Unit number | Internal variables of the Saudi agricultural trade balance model | (U) Theil |
|---|---|---|
| 1 | Average per capita of agricultural exports $Y_{1t}$ | 0.08 |
| 2 | Average per capita of agricultural imports $Y_{2t}$ | 0.06 |

Table 2 shows the results of the Thiel test of the variables of the simultaneous model of the Saudi agricultural trade structure, which show that the model has a reasonable predictability, where the u value is below zero and is far from the right one.

The behavior of the variables of the current model of the Saudi foreign trade structure predicted by First: Predict the values of all independent variables of the simultaneous model by calculating the equations of the time trend in different mathematical forms. Using SPSS where the simultaneous trend equation for each independent variable was estimated during the study period (1995-2019) and using the estimated results the values of these variables were predicted for the time period (2020-2026) and the expected values of independent model variables were extracted.

Secondly, based on these independent variables, the estimated regression equation for each follow variable estimated in its independent variables, thus obtaining the expected values of the variables in the Saudi foreign trade model.

### 4.9. Saudi Agricultural Trade Balance Forecasts Using the Results of General Trend Equations, the Single-Equation Model and the Simultaneous Model Until 2026

The importance of statistical estimate of mathematical models that understanding, explaining and describing various economic variables during the time period interpreted or explained by the estimated mathematical model. In addition predicting the values of these variables in the future, assuming that conditions continue during forecast periods. While these predictive values may vary depending on the way they were derived. Predictions obtained through time trend equations that depends on the time in the estimation differs from those obtained through single-equation models that rely on a set of independent variables that explain the phenomenon. Both predictions estimated from time trend equations and single-equation models are different from those obtained through simultaneous models that depended on a set of equations with overlapping, interlocking and influential relationships. However, economic logic and statistical significant indicate that based on simultaneous models are more predictively efficient than time trend equations and single-equation models.

In order to do so, this part of the study deals with comparing the expectations of the three methods mentioned above as different alternatives to a same phenomenon although simultaneous models are more efficient.

#### 4.9.1. Agricultural Exports

Using results from time trend, single-equation models or simultaneous models, Table 3 and Figure 4 show that the average per capita agricultural exports in 2026 are expected to reach about 624 (SR/capita) using the simultaneous model. During the same year, it is expected to reach about 620 (SR/capita) using the single-equation model. This represents about 99% of its value in 2026 using the simultaneous model. The average per capita agricultural exports in 2026 expected to reach about 628 (SR/capita) using general trend model, representing about 101% of its value during the same year using the simultaneous model.
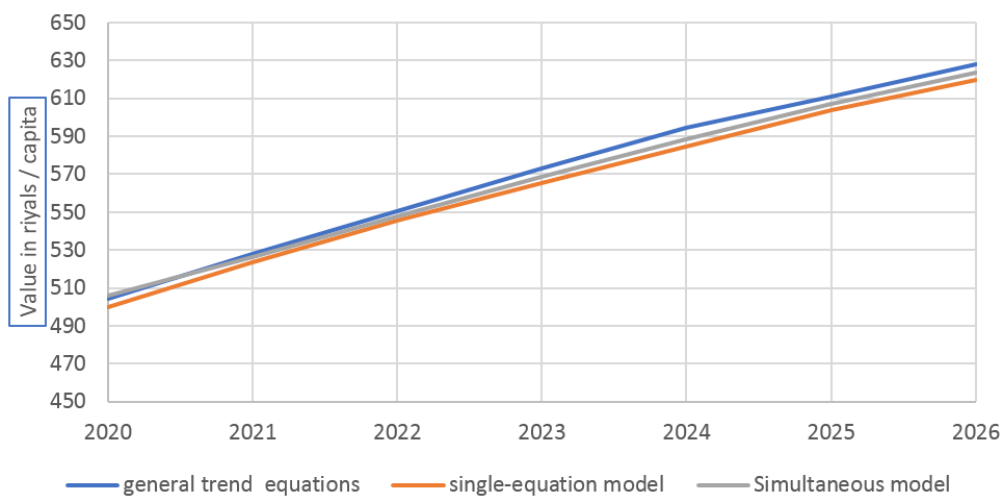
**Table-3.** Average per capita prediction of total agricultural exports using time trend equations, single-equation model and Simultaneous model during the period (2020-2026).

| Years | Time trend | Single-equation model | Simultaneous model |
|-------|-----------|----------------------|-------------------|
| 2020 | 504 | 500 | 506 |
| 2021 | 528 | 524 | 526 |
| 2022 | 550 | 546 | 547 |
| 2023 | 573 | 565 | 568 |
| 2024 | 595 | 584 | 588 |
| 2025 | 611 | 603 | 607 |
| 2026 | 628 | 620 | 624 |



**Figure-4.** Average per capita prediction of total agricultural exports using time trend equations, single-equation model and Simultaneous model during the period (2020-2026).
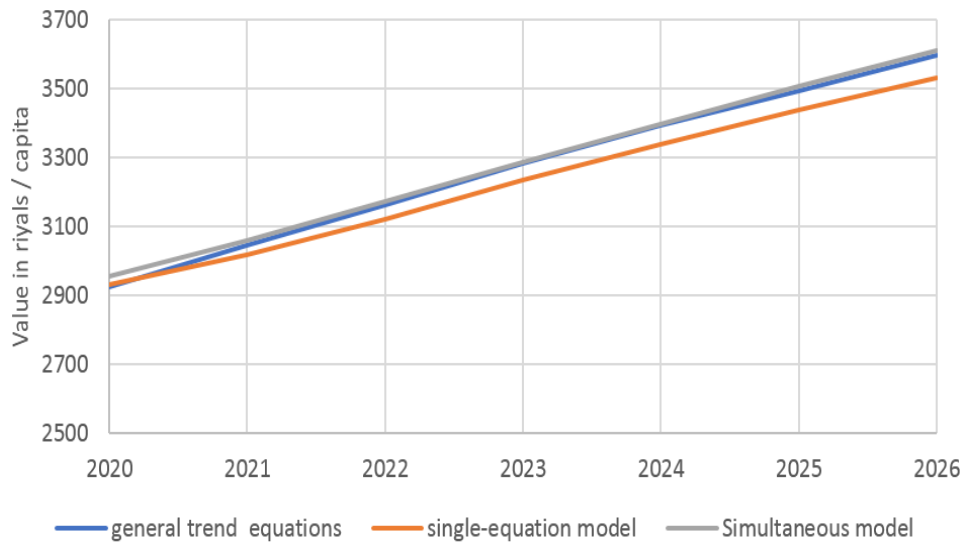
*4.9.2. Agricultural Imports*

Table 4 and Figure 5 show that the average per capita agricultural imports in 2026 are expected to reach about 3,609,000 (SR/capita) using the simultaneous model, it expected to reach about 3,530,000 (SR/capita), during the same year using the single-equation model.

This represents about 98% of its value in 2026 using the simultaneous model. The average per capita agricultural imports in 2026 expected to reach about 3,596,000 (SR/capita) using time trend equations, which represent about 100% of its value during the same year using simultaneous model.

**Table-4.** Average per capita prediction of total agricultural imports using time trend equations, single-equation model and Simultaneous model during the period (2020-2026).

| Years | Time trend | Single-equation model | Simulations model |
|-------|-----------|----------------------|-------------------|
| 2020 | 2926 | 2932 | 2955 |
| 2021 | 3044 | 3018 | 3058 |
| 2022 | 3164 | 3122 | 3171 |
| 2023 | 3283 | 3233 | 3286 |
| 2024 | 3392 | 3339 | 3398 |
| 2025 | 3494 | 3436 | 3506 |
| 2026 | 3596 | 3530 | 3609 |



**Figure-5.** Average per capita prediction of total agricultural imports using time trend equations, single-equation model and Simultaneous model during the period (2020-2026).

*4.9.3. Agricultural Trade Balance:*

Table 5 and Figure 6 show that the average per capita agricultural deficit using time trend equations is expected to be about 2,968,000 (SR/capita) in 2026, representing about 102% of the average per capita agricultural deficit using the simultaneous model (2,923,000 SR/ capita) during 2026.

**Table-5.** Average per capita prediction of the agricultural deficit using time trend equations and the Simultaneous model during the period (2020-2026).

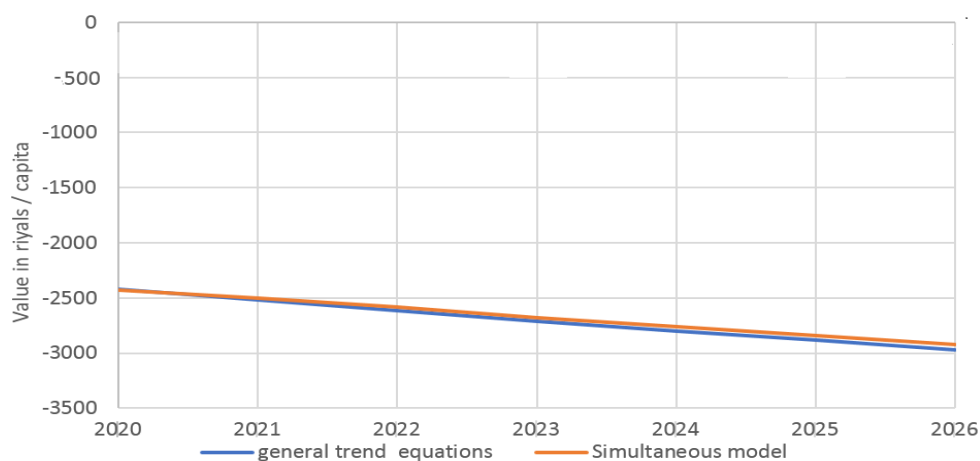| Years | Time trend | Simultaneous model |
|-------|-----------|-------------------|
| 2020 | -2422 | -2431 |
| 2021 | -2516 | -2500 |
| 2022 | -2614 | -2585 |
| 2023 | -2710 | -2676 |
| 2024 | -2797 | -2764 |
| 2025 | -2883 | -2844 |
| 2026 | -2968 | -2923 |

**Figure-6.** Average per capita share of the agricultural deficit using time trend equations and the Simultaneous model during the period (2020-2026).

## 5. CONCLUSION AND RECOMMENDATIONS

The most important recommendations can be summarized in the light of the results of the study as follows:

A. Re-evaluating and distributing the plan of agricultural exports and imports of Saudi Arabia taking into account contemporary domestic and international variables so that Saudi Arabia's agricultural economy is less affected by any shocks by the economies of other countries. This plan should be dynamic to cope with the expected fluctuations.

B. Re-evaluating the plan for the development of agricultural exports and the use of agreements signed between the Kingdom and some international and Arab economic cartels in an attempt to reduce the permanent deficit in the Saudi agricultural balance must be reassessed.

C. The study showed that no one factor or variable can have an impact on Saudi agricultural exports and imports, but there are many domestic variables (total agricultural output, agricultural consumption, ....) and external (activating the Kingdom's accession to the World Trade Organization, the Greater Arab Free Trade Area, the Gulf Cooperation Council) overlapping to create this change. Therefore, the study recommends that these variables should be considered as an integrated package that affects the development of Saudi agricultural exports and the reduction of their imports in the coming years.

D. From the given findings of the statistical estimated of the time trend model of Saudi agricultural foreign trade variables, we expect an increase in the proportion of agricultural imports in the near future. Thus, the study recommends that the policy of agricultural export development should be encouraged and the competitiveness of Saudi agricultural products should be increased in the foreign markets as an attempt to rebalance the agricultural trade balance.

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