# The intervening effect of technical, procedural, and commercial policies on the determinants of wheat production in selected Arab countries for the period 1995-2020

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**Abstract**

The research aims to study the extent of the overlapping effect of production (technical) policies, procedural supply policies, trade policies, and import policies by adopting dependent variables and a number of independent variables to know their effects on the first dependent variable production, through the use of the panel model using the ordinary least squares method (Panel Dynamic Ordinary Least Squares (PDOLS), It was shown that the clear effect of agricultural technical policy on the determinants of wheat production in the countries selected in the study, the strongest of these effects appeared in the share of the dunum of agricultural work, then in technology, and finally in mechanical technology, while agricultural support cannot be considered a determinant of wheat production, as there is an overlapping effect of technical, procedural, and trade policies on the determinants of wheat imports for the countries selected in the research, the strongest of these effects appeared in the population numbers of the countries selected in the research, then in the exchange rate rate, and finally in the world price of wheat, as the agricultural procedural policy related to the wheat crop occupies the first place, followed by agricultural trade policy, and finally agricultural technical policy. The researchers recommend the necessity of adopting agricultural policies that are concerned with increasing agricultural production and working to limit the obstacles and determinants, which In turn, it increases the supply of crop production and thus reduces imports, which reduces pressure on the state budget .

**Keywords: Panel models, production, wheat supply.**

**Introduction :**

The economic reality in many developing countries is characterized by food shortages. This is due to the population growth rates that exceed the rates at which agricultural production is increasing, in addition to the presence of other factors that characterize the economies of developing countries, including the dominance of raw material production, and the different prevailing production systems and their relationships, which causes a deterioration in agricultural production in terms of quantity and quality. This has resulted in an increase in the volumes of their imports and the values of agricultural consumer products. As for their exports, most of them depend on the production and export of one commodity or a specific number of commodities that are characterized by low

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elasticity of global demand. The reason for this lies in their economic backwardness and the nature of their position in terms of specialization and international division of labor. The result of the aforementioned factors has put developing countries in a critical situation represented by their dependence on external sources to feed their populations. This has required them to activate the agricultural import function of consumer products, especially strategic grain crops, and the undesirable effects that this has on the economies of developing countries, the most important of which is the increase in the burdens of their balance of payments due to the high values of imported agricultural products, whose prices have reached very high digital levels .

Research problem:

All sample countries suffer from a decline in the production of some strategic crops, which led to developing countries importing agricultural products, especially strategic crops, especially wheat, to the extent that they were in a critical situation represented in their dependence on external sources to feed their population. This required activating the wheat import function. Usually, this function is affected by other variables, including the quantities produced and supplied for this crop. Therefore, the three sample functions (Iraq, Egypt, and Syria) are affected by a group of variables according to the nature of the economic and trade policies adopted by the countries of the study sample, represented in production support programs and procedural policies, in addition to the supply and imported quantities of the crop under study (wheat) and their impact on production determinants .

Importance of the research:

It is clear from the extrapolation of the economic reality in the sample countries that they have an economic reality that is very sensitive to changes in the values and quantities of agricultural imports due to the dependence of local demand on them mainly, as they work to meet the local demand that is greater than local production, so any slowdown in their preparation is reflected in negative effects on the nature of consumption and local use of them, as its importance increases over time due to the inability of agricultural economic policies to provide these types of crops, which does not only represent an obstacle to their economic growth, but also represents an obstacle to their political independence .

Research hypothesis:

The research is based on the hypothesis that there are a number of factors that contribute to varying effects in their effects on the production functions, supply and imports of wheat crops in a number of developing countries with special reference to Iraq during the period (1995-2020 . (

Research objective :

The research aims to study the reality and impact of technical production overlap policies and wheat supply and imports, estimating their functions on the determinants of wheat production for the period (1995-2020), as some solutions are being put in place to promote this important crop in the daily life of the consumer. A number of studies have addressed such an important topic, including the study presented by [11], with a study on the impact of agricultural technologies on agricultural production and the extent of their impact on the agricultural sector during the period 1990-2013, as it showed that the impact

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of technological development positively affects the amount of agricultural output by an amount of (0.808%) of the total fixed capital formation, and that the contribution rate of this sector has reached an amount of (14.49%). The researchers recommended the need to increase the introduction of technology into the agricultural sector. [10] also presented a study entitled An Economic and Standard Study to Study the Impact of the Wheat Crop Supply Function for the Period 1990-2013, as it was shown that there is A large food deficit for this crop and that it does not meet the main needs of the population using the size of local demand as a dependent variable and each of the cultivated areas, government and local prices and previous prices as independent variables, as it was shown that local prices had a significant impact on the acceptance and support of producers, which had a positive impact on agricultural output. [1] also explained in 2017 a study on studying the response of strategic crops using ARDL distributed lag models and the joint integration mechanism to estimate long-term equilibrium functions, using each of the cultivated areas, crop price, production and price risk as explanatory qualitative variables and the response of crop supply as a dependent variable. [2] also presented a study on estimating the wheat crop supply function for the period using the corrected least squares (FMOLS) method to estimate the coefficients and independent variables, as it was shown that the decrease in wheat crop supply was caused by the decline in crop support and the adoption of old production methods, which led to the poor exploitation of resources, causing a decline in crop production, but our study differs from previous studies in the method of work Statistical and standard, as our study was distinguished in the method of calculating the factors and the multiplicity of policies used for production determinants, as the panel model was used using the ordinary least squares (PDOLS) method ,

as explained in the work methods and as follows :

Materials and methods :

It is noted from the method of describing the model in this research that data covering the period (1995-2020) were used for three countries (Iraq, Egypt, Syria) with three dependent variables, which are (production, supply and import of wheat) in order to know the overlapping effect of these policies and production determinants, as shown in Table (1). We relied on data from the Iraqi Ministry of Planning and Development Cooperation, as well as the Arab Organization for Agricultural Development and the World Food Organization (FAO) for research

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| variable | Type | Variable symbol | Description |
|---|---|---|---|
| **Wheat Production** | dependent | **WP** | Quantity of wheat produced (tons) |
| **Wheat Supply** | dependent | **WS** | Quantity of wheat supplied (tons) |
| **Wheat Import** | dependent | **WI** | Quantity of wheat imported (tons) |
| **Share of the Dunum of Agricultural Work** | independent | **AW** | Total number of workers divided by total number of hectares planted with wheat |
| **Mechanical Technology** | independent | **MT** | Mechanical agricultural technology methods (thousand horsepower) include soil preparation |

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| variable | Type | Variable symbol | Description |
|---|---|---|---|
| | | | operations, fertilizer spreaders, pesticide sprayers, harvesters in addition to traditional or modern irrigation machines |
| **Chemical Technology** | independent | **CT** | Chemical technology (thousand tons) includes chemical pesticides, growth regulators, agricultural fertilizers and fertilizers |
| **Agricultural Support** | independent | **AS** | Is the government support (thousand dollars) paid to farmers and agricultural business companies to increase their income and manage the supply of agricultural commodities |
| **Cultivated Area** | independent | **CA** | Total area planted with wheat (hectares) |
| **Local Price** | independent | **LP** | Price of one ton of wheat in US dollars |
| **Population** | independent | **PO** | Total population (million people) |
| **International Price** | independent | **IP** | Price of one ton of wheat in US dollars |
| **Exchange Rate** | independent | **ER** | Number of local currency units equivalent to one dollar |

**Table (1): Description of the standard model**

In this research, three functions will be estimated :

A- Wheat production function: This function shows that the amount of wheat crop produced (WP) as a dependent variable is affected or responds to changes in four independent variables: the share of the dunum of agricultural work (AW), mechanical technology (MT), chemical technology (CT), agricultural support (AS), in addition to the random error (U), i.e. :

$$WPit = F (AW it , MTit ,CTit ,ASit) + Uit \quad i = 1,2,3 \ ; \ t=1,2,...,26 \ \ldots\ldots\ldots(1($$

Where the symbol (i) refers to the sequence of countries: Iraq = 1, Egypt = 2, Syria = 3. While the symbol (t) refers to the sequence of study years for the period (1995-2020).

B- Wheat supply function: This function shows that the quantity of wheat crop supplied (WS) as a dependent variable is affected or responds to changes in three independent variables: the quantity of wheat produced (estimated from equation (1)) ((WP)^), the Cultivated Area (CA), the local price of wheat (LP), in addition to the random error (V), i.e.:

$$WSit = F (W\hat{P}it ,CAit ,LPit) + Vit \quad i=1,2,3 \ ; \ t=1,2,...,26 \ \ldots\ldots\ldots(2($$

C- Wheat import function: This function shows that the quantity of wheat produced (WI) as a dependent variable is affected or responds to changes in four independent variables: the quantity of wheat supplied (estimated from equation (2)) ((WS)^), population (PO), world price of wheat (IP), exchange rate (ER), in addition to random error (W), i.e :

$$WIit = F (W\hat{S}it ,POit ,IPit ,ERit) + Wit \quad i=1,2,3 \ ; \ t=1,2,...,26 \ \ldots\ldots\ldots(3($$

Using the Panel Dynamic Ordinary Least Squares (PDOLS) model:

In this research, the Panel Dynamic Ordinary Least Squares (PDOLS) technique, which was partially developed by [13] and [15], was applied to determine the characteristics of wheat production, wheat supply, and wheat

imports in the long run for Iraq, Egypt, and Syria. This procedure is based on the dynamic ordinary least squares method in time series, which was invented by [21] and then generalized by [22], which has many advantages, including that it leads to direct estimates in the case of a mixture of static variables at level I(0) or the first difference I(1), and that it leads to efficient estimators, and can be used well in small samples, in addition to avoiding the problem of interference between the independent variables and the error variable .

The application of the PDOLS technique includes four basic steps :

Step 1: The cross-sectional dependence of the data is tested to verify the extent of the data dependence on the cross-sections and thus using the appropriate tests for stationarity (unit root tests). Among the most commonly used tests in the case of cross-sectional dependence of panel data are: Breusch-Pagan LM [4], Pesaran Scaled LM [18], Bias-Corrected Scaled LM [3], (CD) [6 . [

Step 2: When accepting the hypothesis of no cross-sectional dependence of the data, the first generation of stationarity tests are used, which include tests such as (Dickey & Fuller, 1979), Fisher-PP, Z-test of [8], (Levin, Lin & Chu, 2002) (LLC), [5] and (IPS) [9]. In the case of accepting the hypothesis of cross-sectional dependence, the second generation of unit root tests is used, which provide more accurate information than using first-generation tests [17]. Among these tests is the expanded Dickey-Fuller test in the case of cross-sectional dependence, abbreviated as (PESCADF) [20] . Step 3: If all or some of the variables are non-stationary, cointegration is tested using error tests resulting from the panel model estimation and group statistics of [19], [13], or [12] test

Step 4: The dynamic ordinary least squares (PDOLS) method

is used to identify the long-run factors affecting wheat production, wheat supply, and wheat imports. Formally, the research model is specified as follows:

run relationship of equation (4) is based on the following regression model :

where Δ is the first difference parameter, Yt is the dependent variable, λ is the dependent variable parameter, α is the dependent variable parameters in the previous periods, β is the vector of independent variables parameters, Xt is the vector of independent variables, εt is the random error term. The estimation of the long-

where β is the vector of long-run coefficients, X_(t-i)^* is the vector of independent variables at first difference I(1). Lead-Lags (k) are added to the set of independent variables with I(1) to eliminate the problems of endogeneity and autocorrelation

.

$$Y_t = \alpha_0 + \beta X_t + \sum_{i=-k}^{k} \Phi X^*_{t-i} + \varepsilon_t \qquad (5)$$

Results and Discussion

Descriptive Statistics:

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**Table (2): Descriptive statistics for research variables for the countries selected in the study during the period (1995-2020(**

| Variables | Mean | Low Value | Highest Value | Standard Deviation |
|---|---|---|---|---|
| Wheat production (WP) (tons) | 2,965,071 | 9,467 | 8,277,051 | 2,662,219 |
| Wheat supply (WS) (tons) | 4,719,150 | 9,292 | 15,871,851 | 4,895,989 |
| Wheat import (WI) (thousand tons) | 9,038 | 4.50 | 57,065 | 12,409 |
| Agricultural labor share (AW) (worker/dunum) | 3.14 | 0.44 | 9.92 | 2.73 |
| Mechanical technology (MT) (thousand horsepower) | 3,420 | 132 | 7,404 | 2,433 |
| Chemical technology (CT) (thousand tons) | 684 | 228 | 1,885 | 442 |
| Agricultural support (AS) (thousand dollars) | 13,950 | 32,130 | 4,009 | 6,405 |
| Cultivated area (CA) (hectares) | 870,895 | 31,539 | 3,796,020 | 708,960 |
| Local price (LP) (dollars/ton) | 313.3 | 63.4 | 654.3 | 148.8 |
| Population (PO) (people) | 43,022,503 | 14,300,000 | 98,423,602 | 27,855,450 |
| World price (IP) (dollars/ton) | 204 | 117 | 304 | 59 |
| Exchange rate (ER) (local currency/dollar) | 510.71 | 3.38 | 1972.0 | 669.0 |

Figure (1) shows the development of wheat production in the countries selected for the study during the period (1995-2020), where the figure shows the significant deterioration in wheat production in Iraq compared to Egypt and Syria, and this is due to the unstable security and political conditions that Iraq went through during the mentioned period. For the same reasons, Syria witnessed a noticeable decline in wheat production starting from the year (2016). In Egypt, wheat production witnessed a significant increase accompanied by some fluctuations during the study period. Given the strong correlation between wheat production and supply, the development of wheat crop supply in the countries selected for the study during the period (1995-2020) may not differ much from production, as shown clearly in Figure (2). Regarding wheat imports to the countries selected for the study, the picture appears to be different from crop production and supply, as it is noted that Iraq outperformed both Egypt and Syria in imports, especially after the fall of the regime in 2003 and the subsequent unstable security and political conditions that were reflected in the neglect of the agricultural sector in general, the lack of support directed to it, the collapse of the sector's infrastructure, the scarcity of water resources, and the weakness of agricultural land reclamation, all of which led to a large and unplanned reliance on wheat imports, as shown clearly in Figure (3

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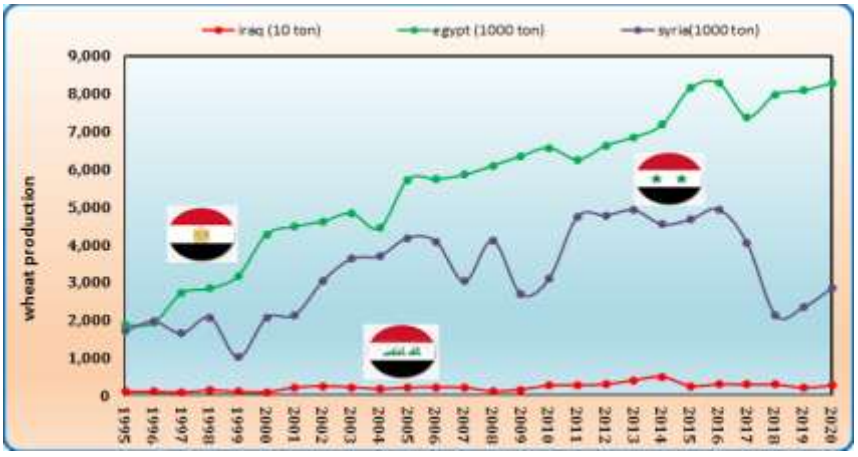


**Figure (1) Development of wheat production in the research sample countries during the period (1995-2020(**

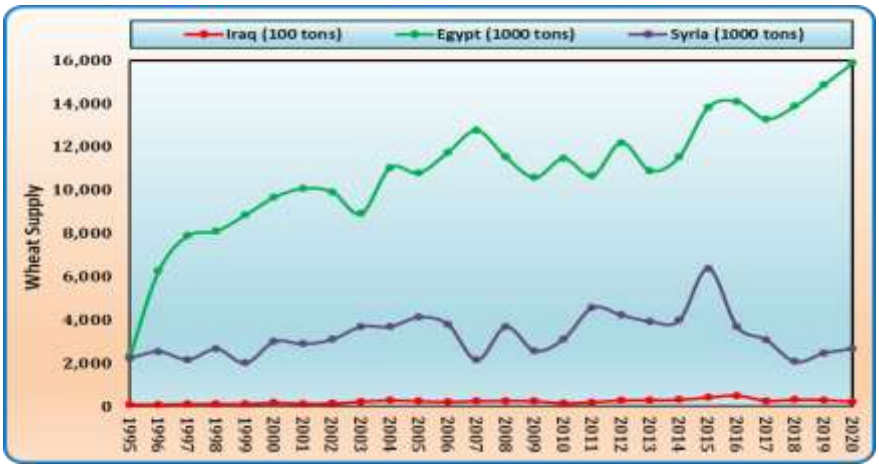


**Figure (2) Development of wheat supply for the research sample countries during the period (1995-2020(**

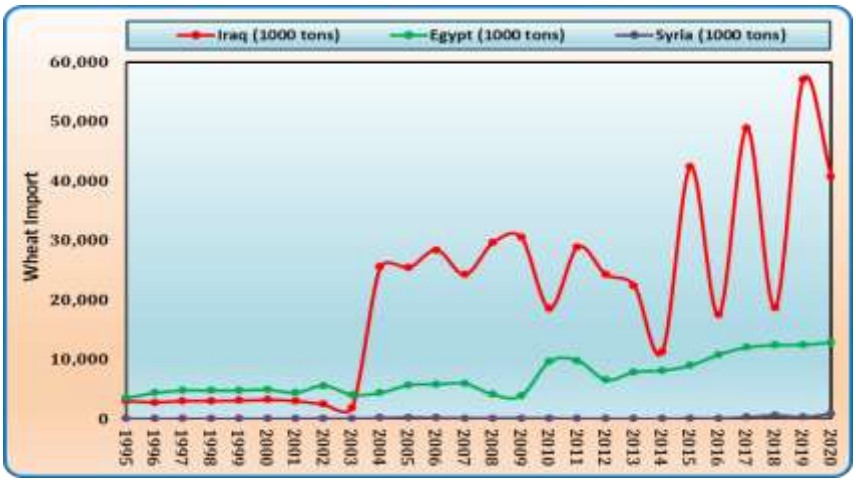


Figure (3)The development of wheat imports to the research sample countries during the period (1995-2020(

-2 Correlations:

Table (3) shows Pearson correlations between the independent variables and the dependent variable for each of the research functions .

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**Table (3): Simple correlations between the variables of the research functions**

| Function | Independent variables | Dependent variables WP | WS | WI |
|---|---|---|---|---|
| Production | AW | 0.422** | | |
| | MT | -0.592** | | |
| | CT | 0.725** | | |
| | AS | -0.126 | | |
| Supply | CA | | 0.410** | |
| | LP | | -0.008 | |
| Import | PO | | | 0.852** |
| | IP | | | 0.149 |
| | ER | | | -0.187 |

The correlation is significant at 1% and 5% significance levels, respectively.

The results of the correlations between the variables of each of the research functions indicate the following :

-There is a positive relationship between the share of the dunum of agricultural work (AW) and wheat production (WP) at a significance level of (1%). Increasing the number of workers used in wheat cultivation will lead to an increase in wheat production and vice versa. Mechanical technology (MT) is negatively related to wheat production at a significance level of (1%). Increasing the mechanical technology used in wheat cultivation leads to a decline in wheat production. This result may seem contrary to economic logic and may be due to the improper use or waste in the use of mechanical technology in Iraq, Egypt and Syria, which may lead to a decline in production instead of an increase in these countries. As for chemical technology (CT), it is strongly related to wheat production at a significance level of (1%). Increasing the chemical technology used in wheat cultivation leads to an increase in production and vice versa. It seems that agricultural support (AS) has no relation to wheat production, and this is due to the general decline in agricultural support in the countries selected for the research .

-There is a positive relationship between the area planted with wheat (CA) and wheat supply (WS) at a significance level of (1%). Increasing the geographical area planted with wheat leads to an increase in wheat production and vice versa. The price of wheat in the local markets of the countries selected in the study (LP) has no relationship with wheat supply .

-There is a very strong positive relationship between the population (PO) and wheat imports (WI) at a significance level of (1%). Increasing the population will lead to an increase in wheat imports. The world price of wheat (IP) has no relationship with its import to the countries selected in the study. The growing need for wheat, whether to meet the increase in population or to cover the decline in wheat production, will push the governments of the three countries to increase imports even in light of the rise in global

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wheat prices. Also, the exchange rate of the US dollar against local currencies (ER) in the countries selected in the study has no relationship with wheat imports to these countries.

-3Cross-sectional and unit root dependence tests :

The results in Table (4) indicate that there is cross-sectional dependence at a significance level of (1%) for the data and for each of the research variables. This indicates that any shock to any of the determinants of wheat production, supply and import in one of the three countries will lead to radical changes in the same determinant for the other two countries. This is due to the fact that wheat is considered the most important food commodity in the world, and shocks to the production of this commodity may threaten the food security of many countries in the world. In light of this result, unit root tests will be used for the second generation panel data as in Table (5 .(

**Table (4): Results of the cross-sectional dependence test for the research function variables**

| Variables | **Breusch-Pagan LM** | **Pesaran scaled LM** | **Bias-corrected scaled LM** |
|---|---|---|---|
| Wheat Production(WP) | 34.344** | 12.796** | 12.736** |
| Wheat Supply(WS) | 22.770** | 8.071** | 8.011** |
| Wheat Import(WI) | 27.776** | 10.115** | 10.055** |
| Agricultural Work Per Dunum(AW) | 13.622** | 4.337** | 4.277** |
| Mechanical Technology(MT) | 24.653** | 8.840** | 8.780** |
| Chemical Technology(CT) | 24.259** | 8.679** | 8.619** |
| Agricultural Support(AS) | 47.412** | 18.131** | 18.071** |
| Area Cultivated(CA) | 8.332* | 2.177* | 2.117* |
| Domestic Price(LP) | 37.530** | 14.097** | 14.037** |
| Population(PO) | 53.081** | 20.445** | 20.385** |
| International Price(IP) | 78.000** | 30.619** | 30.559** |
| Exchange Rate(ER) | 32.937** | 12.221** | 12.161** |

* ,**The cross-sectional dependence is significant at 1% and 5% significance levels, respectively.

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**Table (5): Second-generation unit root test (PESCADF) for time series of research variables**

| Variables | the condition | PESCADF Constant | PESCADF Constant + Trend | Degree of stillness |
|---|---|---|---|---|
| Wheat Production (WP) | Level | -2.244* | -3.141*** | I(0) |
| | First Team | -- | -- | |
| Wheat Supply (WS) | Level | -3.085*** | -3.249*** | I(0) |
| | First Team | -- | -- | |
| Wheat Import (WI) | Level | -1.455 | -1.572 | I(1) |
| | First Team | -6.425*** | -6.696*** | |
| Agricultural Work Per Dunum (AW) | Level | -1.391 | -2.997** | I(0) |
| | First Team | -- | -- | |
| Mechanical Technology (MT) | Level | -0.812 | -2.746** | I(0) |
| | First Team | -- | -- | |
| Chemical Technology (CT) | Level | -1.884 | -1.972 | I(1) |
| | First Team | -5.021*** | -5.354*** | |
| Agricultural Support (AS) | Level | -0.870 | -0.456 | I(1) |
| | First Team | -22.451*** | -15.541*** | |
| Area Under Cultivation (CA) | Level | -1.360 | -2.449 | I(1) |
| | First Team | -4.853*** | -4.763*** | |
| Domestic Price (LP) | Level | -1.557 | -1.439 | I(1) |
| | First Team | -3.872*** | -3.829*** | |
| Population (PO) | Level | -3.552*** | -1.399 | I(1) |
| | First Team | -2.334* | -4.040*** | |
| International Price (IP) | Level | -3.173** | -3.125** | I(0) |
| | First Team | -- | -- | |
| Exchange Rate (ER) | Level | -2.373** | -2.439 | I(1) |
| | First Team | -2.417** | -4.266*** | |

* ,**The time series are stationary at 1% and 5% significance levels, respectively.

The results of the second generation unit root test (PESCADF) indicate that the variables: wheat production (WP), wheat supply (WS), agricultural labor per dunum (AW), mechanical technology (MT), and world wheat price (IP) were stationary at level I(0), while the variables: wheat import (WI), chemical technology (CT), agricultural support (AS), cultivated area (CA), domestic wheat price (LP), population (PO), and exchange rate (ER) were stationary at first difference I(1). In light of these results, the research functions can be estimated using the dynamic ordinary least squares method for panel data after verifying the existence of a cointegration relationship between the variables of each research function.

-4 Co-integration test:

The existence of a co-integration relationship between the variables of the function means that these variables move jointly and simultaneously in the long run. And that changes in one variable, on average, generate changes in the other variables over time. In light of the results of the Kao test for co-integration between the variables of each of the three functions specific to wheat crops and the countries of the research sample, we note that all the results were significant, which indicates the following :

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• The existence of a long-term equilibrium relationship between wheat production on the one hand, and each of the share of the dunum of agricultural labor, mechanical technology, chemical technology, and agricultural support.

•The existence of a long-term equilibrium relationship between wheat supply on the one hand, and each of wheat production, the area planted with wheat, and the local price of wheat.

•The existence of a long-term equilibrium relationship between wheat imports on the one hand, and each of wheat supply, population, world wheat price, and exchange rate

.

**Table (6): Kao test for cointegration**

| Kao Residual Cointegration Test<br>Null Hypothesis: No cointegration | | |
|---|---|---|
| Function | **t-Statistic** | **Prob.** |
| Wheat Production Function | -1.949* | 0.025 |
| Wheat Supply Function | -4.227** | 0.000 |
| Wheat Import Function | -7.583** | 0.000 |

* ,**Co-integration exists at 1% and 5% significance levels, respectively.

-5 Estimation of search functions:

Based on the previous results, the long-term relationship will be estimated for each of the three search functions. There are several methods that allow these estimates depending on the characteristics of the data and the results of the previous tests that were conducted. In this case, we will use the dynamic ordinary least squares (PDOLS) method, where one of the advantages of this method is that it can be applied to both static and non-stationary data [16], which allows us to include all the independent variables mentioned previously in these functions and in light of the results of the unit root test shown in Table (5.(

A. Estimating the wheat production function: Table (7) shows the results of applying the (PDOLS) method to estimate the wheat production function in the long run for the countries of the research sample during the period (1995-2020 .(

**Table (7): Results of the (PDOLS) method for estimating the long-term relationship of the wheat production function**

| Dependent Variable: WP<br>Method: Panel Dynamic Ordinary Least Squares (PDOLS) | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| **AW** | 498428.8 | 135259.3 | 3.6850** | 0.004 |
| **MT** | 298.0714 | 47.08018 | 6.3311** | 0.000 |
| Δ(**CT**) | 45911.35 | 10094.44 | 4.5482** | 0.001 |
| Δ(**AS**) | -205.5815 | 241.8322 | -0.8501 | 0.413 |

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| | | | |
|---|---|---|---|
| **R-squared** | 0.66 | **F-Test** | 82.072** |
| **Adjusted R-squared** | 0.64 | **Prob.** | 0.000 |

* ,**There is a significant effect at the significance level of 1% and 5%, respectively.

Table (7) shows that there is a significant positive effect of the share of agricultural labor per dunum on wheat production at a significance level of (1%). Increasing one worker per dunum planted with wheat will lead to an increase in wheat production in the long term by (498,429) tons. From this result, this variable is considered one of the strongest determinants of wheat production in Iraq, Egypt and Syria. There is also a significant positive effect of mechanical technology on wheat production at a significance level of (1%). Increasing mechanical technology by (1000) horsepower in wheat cultivation will lead to an increase in wheat production in the long term by approximately (298) tons in the countries selected in the research sample. As for the effect of chemical technology on wheat production, there is also a significant positive effect on wheat production at a significance level of (1%). Increasing chemical technology by (1000) tons in wheat cultivation will lead to an increase in wheat production in the long term by (45,911) tons in the countries selected in the research sample. The results showed that there was no significant effect of agricultural support on wheat production in the research sample countries in the long run. This may be attributed to the general decline in agricultural support throughout the research period, as the average annual agricultural support in the three countries did not exceed (13,950,000) dollars, in Iraq (12,707,000) dollars, in Egypt (12,565,000) dollars, and in Syria (16,579,000) dollars. Overall, and through the (F) test, the wheat production function is significant in the long run at a significance level of (1%), as it shows that the function variables explain (64%) of wheat production in the research sample countries.

C. Estimating the wheat supply function: Table (8) shows the results of applying the (PDOLS) method to estimate the wheat supply function in the long run for the countries of the research sample during the period (1995-2020.(

**Table (8): Results of the (PDOLS) method for estimating the long-term relationship of the wheat supply function**

Dependent Variable: WS

Method: Panel Dynamic Ordinary Least Squares (PDOLS)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| $\widehat{\mathbf{WP}}$ | 0.27889 | 0.00140 | 199.841** | 0.000 |
| $\Delta(\mathbf{CA})$ | 0.88775 | 0.00858 | 103.458** | 0.000 |
| $\Delta(\mathbf{LP})$ | 36.3426 | 17.0105 | 2.1365* | 0.047 |
| **R-squared** | 0.99 | **F-Test** | 19395.89** | |
| **Adjusted R-squared** | 0.98 | **Prob.** | 0.000 | |

* ,**There is a significant effect at the significance level of 1% and 5%, respectively.

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Table (8) shows that there is a significant positive effect of wheat production on crop supply at a significance level of (1%). Increasing wheat production by one ton will lead to an increase in crop supply in the long term by (0.279) tons. There is also a significant positive effect of the area planted with wheat on crop supply at a significance level of (1%). Increasing the area planted with one hectare of wheat will lead to an increase in crop supply in the long term by (0.888) tons. As for the effect of wheat crop prices in the local markets of the research sample countries, there is also a significant positive effect of the local price on wheat supply at a significance level of (5%). Increasing the local price by one dollar per ton will lead to an increase in wheat crop supply in the long term by (36.34) tons in the countries selected in the research sample. Overall, through the (F) test, the wheat supply function is significant in the long run at a significance level of (1%), as it shows that the function variables explain (98%) of the crop supply in the countries of the research sample.

D. Estimating the wheat import function: Table (9) shows the results of applying the (PDOLS) method to estimate the wheat import function in the long run for the countries of the research sample during the period (1995-2020 .(

**Table (9): Results of the (PDOLS) method for estimating the long-term relationship of the wheat import function**

Dependent Variable: WI

Method: Panel Dynamic Ordinary Least Squares (PDOLS)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| $\widehat{\mathbf{WS}}$ | -0.00236 | 0.00009 | -26.1520** | 0.000 |
| $\Delta(\mathbf{PO})$ | 0.02252 | 0.00114 | 19.7986** | 0.000 |
| **IP** | -10.8069 | 4.11885 | -2.62376* | 0.047 |
| $\Delta(\mathbf{ER})$ | -130.715 | 4.92893 | -26.5199** | 0.000 |
| **R-squared** | 0.98 | **F-Test** | 3097.10** | |
| **Adjusted R-squared** | 0.85 | **Prob.** | 0.000 | |

* ,**There is a significant effect at the significance level of 1% and 5%, respectively.

The results of Table (9) show that there is a significant negative effect of wheat supply on its import at a significance level of (1%). An increase in the supply of wheat crop by one ton will lead to a decrease in crop imports in the long run by (2.36) tons. There is a significant positive effect of population size on wheat crop imports at a significance level of (1%). An increase in the population by one million people will be met by an increase in wheat imports in the long run by (22,520) tons. As for the effect of wheat crop prices in the global market, there is a significant negative effect of the global price on wheat imports at a significance level of (5%). An

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increase in the global price by one dollar per ton will lead to a decrease in wheat crop imports in the long run by approximately (11) tons for the countries selected in the research sample. Regarding the dollar exchange rate against local currencies in the countries of the research sample, an increase in the dollar exchange rate by one unit of the local currency will be met by a decrease in wheat imports by approximately (131) tons in the long run. Through the (F) test, the wheat import function is considered significant in the long run at a significance level of (1%), as it shows that the function variables explain (85%) of the crop imports to the countries of the research sample .

Conclusions -:

-1 The significant decline in wheat production and supply in Iraq during the period (1995-2020) compared to Egypt and Syria, due to the unstable security and political conditions that Iraq experienced during the mentioned period.

-2 The increase in Iraq's imports of wheat crop during the period (1995-2020) compared to Egypt and Syria, especially after the year (2003) as a result of the neglect of the agricultural sector in general, the lack of support directed to it, the collapse of the sector's infrastructure, the scarcity of water resources, and the poor reclamation of agricultural lands, all of which led to a large and unplanned reliance on wheat imports.

-3 There is a positive statistical relationship between the share of the dunum of agricultural work, chemical technology and wheat production, and a negative statistical relationship between mechanical technology and wheat production, which indicates the misuse or waste in using this type of technology in Iraq, Egypt and Syria, which may lead to a decline in production instead of an increase in these countries. As a result of the decline in agricultural support by the governments of these countries during the study period, it was found that there was no statistical relationship between this variable and wheat production.

-4 There is a positive statistical relationship between the area planted with wheat and the supply of wheat,while the price of wheat in the local markets of the countries selected in the study has no relationship with the supply of wheat.

-5 The main reason for the large increases in wheat imports for the countries selected in the study during the period (1995-2020) is due to the large population increases, and the failure of the increase in wheat production and supply to keep pace with these increases. This resulted in the lack of association between wheat imports and its global price. In addition, there is no relationship between the exchange rate of the US dollar against local currencies and wheat imports.

-6 There is a cross-sectional dependence for each of the research variables, which indicates that any shock to any determinant of wheat production, supply and import in one of the three countries will lead to radical changes in the same determinant for the other two countries. This is due to the fact that wheat is considered the most important food commodity in the world, and shocks in the production of this commodity may threaten the food security of many countries in the world.

-7 Most of the time series of the determinants of wheat production, supply and import were unstable or non-stationary throughout the study period and for the three countries. These determinants are: wheat import, chemical technology, agricultural

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support, cultivated area, local price of wheat, population, and exchange rate .

-8 There is a long-term equilibrium relationship for each of the wheat production, supply and import functions. This shows that the determinants of each function move jointly and simultaneously in the long run, and that changes in one of the determinants, on average, generate changes in the other determinants over time.

-9 The clear impact of agricultural technical policy on the determinants of wheat production in the countries selected in the study. The strongest of these effects appeared in the share of the dunum of agricultural work, then in chemical technology, and finally in mechanical technology, while agricultural support cannot be considered a determinant of wheat production.

-10 There is an overlapping effect of technical and procedural policies on the determinants of wheat supply in the countries selected in the study. The strongest of these effects appeared in wheat prices in the local markets of the countries selected in the study, then in the areas planted with wheat.

-11 There is an overlapping effect of technical, procedural and commercial policies on the determinants of wheat imports for the countries selected in the research. The strongest of these effects appeared in the population numbers of the countries selected in the research, then in the exchange rate rate, and finally in the world price of wheat .

-12 The agricultural procedural policy related to the wheat crop occupies the first place, followed by the agricultural trade policy, and finally the agricultural technical policy.

Recommendations-:

-1 Directing agricultural policies in the sample countries towards horizontal expansion through reclaiming unused lands, as well as vertical expansion through the use of the latest scientific methods with the aim of raising productivity rates per unit area to a level similar to that in developed countries.

-2 Working to find ways to reduce the food gaps for grain crops, especially wheat crops, by relying on scientific methods and approaches in preparing production plans to modernize agriculture in order to achieve the goals set for them.

-3 Working to implement policies and procedures for customs protection, especially for grain crops in Arab countries in general and Iraq in particular, in order to obtain profitable prices for local products, in order to be an incentive for producers to increase production and reduce agricultural exposure, and working to activate the Greater Arab Free Trade Area to benefit from the advantages of economic and regional blocs granted by the World Trade Organization.

-4 Paying attention to the agricultural sector by adopting an effective agricultural policy capable of raising the productive efficiency of this sector by paying attention to the human element to be technically and administratively qualified to carry out agricultural work.

-5 Expanding the use of modern technology represented in the use of modern production requirements such as mechanization, fertilizers and high-yield varieties, in addition to expanding the modern irrigation system, especially in rain-fed areas.

-6 Paying attention to agricultural guidance through its various methods and paying attention to the rural youth element by involving them in advanced and continuous qualification courses and activating the role of cooperative societies in order to increase the efficiency of the farmer in cooperation with

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modern technologies used to increase production.

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