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Explaining the Increase in Food Subsidy Expenditures in Tunisia

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منتدى البحوث الاقتصادية

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ABSTRACT

Since 2011, in a post-revolutionary context, the debate on the CGC in Tunisia has resurfaced with each finance law. In this debate, the surge in compensation charges is most often attributed to the surge in world prices and/or the increase in consumption of subsidized products. Such an analysis obscures a multitude of variables that are the expression of the economic policies implemented and that contribute to the variability of compensation charges. However, it is precisely the identification of these factors that can provide a reliable explanation of the reduction or increase in budgetary allocations granted under compensation and inaugurate avenues of reflection on the possibilities of reforming the subsidy system. And it is to the identification of these factors that this contribution is devoted.

1. Introduction

In Tunisia, the State has always been responsible for subsidizing the consumption of basic food products through the Caisse Générale de Compensation (CGC). Established in 1970, the purpose of this fund was to mitigate the effects of fluctuations in the prices of basic food products (particularly imports), thereby preserving the purchasing power of certain population groups and curbing inflation. The CGC thus appears to be a genuine regulatory instrument, provided that its costs do not exceed a certain level.

From a derisory level until 1974, CGC expenditure grew steadily thereafter, and a reform was initiated in the mid-1980s to keep the economic cost of the subsidy in line with the country's financial capacity. Benefiting from a downward trend in world agricultural prices, if not moderate increases, compensatory expenditures were kept relatively under control in the period 1985-2005, helping to contain inflation.

In 2006-2008, the global food crisis and the unprecedented rise in world prices of agricultural commodities led to an increase in the food bill and a sharp rise in GSC spending (Akkari and Jouili, 2010). Since then, subsidy expenditures have resumed an upward trend, and the subsidy mechanism has become a heavy burden on the government budget.

In this context, a debate on the effectiveness of this regulatory mechanism is underway and has gained momentum in recent years. This debate is most often approached purely from the point of view of the budgetary cost of subsidies, whose increase is linked to the rise in world prices. Of course, the issue of the public deficit cannot be overlooked, but an overall approach to this variability limits the analysis to budgetary considerations of a purely accounting nature and ends up obscuring the true nature of the factors behind it. However, it is precisely by identifying these factors that we can provide a reliable explanation for the increase in subsidy expenditure.

To illustrate, in addition to world prices, cereal subsidies depend on imported quantities, which reflect the country's level of food dependence. The amount of this subsidy also depends on the level of producer prices, which is an indicator of agricultural cereal policies. It also depends on the variability of the exchange rate, which captures the effect of monetary policy.

Using an appropriate methodology, the aim of this paper is to analyze the contribution of various variables, in addition to the rise in world prices, to the increase in subsidy expenditure. Such an analysis will enable us to put forward certain elements in view of the stated desire to gradually replace food subsidies with direct cash transfers.

Our methodology is based, first, on an analysis of the evolution of subsidy expenditure to detect the variables which affect them. After which, the econometric tool is used to identify the effect of the different variables on the amount of subsidy allocated to durum wheat and soft wheat respectively. The choice of these two commodities is justified by the importance of their share in household food consumption and subsidy expenditure.

2. Evolution of compensation expenses

The need to compensate for the prices of certain products became apparent to the Tunisian public authorities as early as 1945, and the organic budget law of 1967 merely reformulated the Beylical decree of June 28, 1945, which introduced the country's first known form of compensation. In 1970, Act no. 26 of May 29 created the Caisse Générale de Compensation (CGC) in its current form. The move towards extroversion meant that wage costs had to be kept under control, as this was a prerequisite for making exports competitive (Jouili, 2008 and 2021).

Article 3 of the law establishing the CGC stipulated that it is “intended to influence the prices of essential goods, products and services, in particular by means of subsidies and equalization”. The public authorities have therefore created this instrument, through which they assume responsibility for a fraction of the real prices of certain essential products, to keep them within tolerable limits. The CGC's scope of intervention has been very broad, ranging from subsidies on certain inputs to subsidies on a range of food products, including export premiums for certain products and subsidies to certain organizations. For the most part, however, the Fund's expenses were often allocated to two or three food products. The Fund's objective remained fundamentally focused on supporting the prices of essential foodstuffs. Over the period 1970-1985, cereals and oils alone absorbed 70% of the Fund's total expenditure (table 1). This spending helped to stabilize the prices of essential consumer products, and relatively safeguard the purchasing power of the poorer groups of the population.

Table 1 : Evolution of CGC expenditure, 1970-1985 in million dinars (MD)

	1970-1977		1978-1985		1970-1985	
Products	MD	%	MD	%	MD	%
Cereals	74,8	34,9	758	60,5	832,8	56,8
Oils	46,3	21,6	157,5	12,5	203,8	13,9
Sugar	30,3	14,1	33	2,6	63,3	4,3
Milk	0	0	31	2,5	31	2,1
Meats	9,6	4,6	40,8	3,3	50,2	3,4
Fertilizers and others	53	24,8	233,4	18,6	286,5	19,5
Total	**214**	**100**	**1253,7**	**100**	**1467,6**	**100**

Source: Central Bank of Tunisia

As a result, thanks to the CGC, the State assumed part of the wage costs of companies, thereby increasing their competitiveness, especially in foreign markets. Hence, the strategic importance of the CGC as a regulatory mechanism. However, the stagnation of agricultural production led to a heavy reliance on imports, which in turn required ever greater intervention in prices through the CGC.

At just 1.3 million dinars until 1973, CGC expenditure grew steadily from 1974 onwards, reaching 263.7 million dinars in 1985. These expenses rose particularly sharply with the boom in cereal prices on the world market from 1979 onwards. Between 1977-79 and 1980-82, the average rise in import prices was 90% for sugar, 65% for soft wheat and 49% for durum wheat and dairy products. Over the same period, local prices for the main food products rose sharply, with average increases of 44% for olive oil, 31% for durum wheat and barley, and 28% for soft wheat.

While the State was able to meet these expenses until the mid-1980s, the drying up of oil revenues called into question the State's regulatory action, as internal imbalances increased (Ben Hammouda, 1995). As a result, the CGC began to be perceived as a heavy burden. This excerpt from the 1981 Economic Budget clearly illustrates the anguish felt by political leaders in the face of rising CGC expenditure: “In 1981, we must be able to begin serious reflection on the problem of the Compensation Fund, and decide clearly whether we should concern ourselves solely with balancing the Fund, which already has a very large accumulated deficit, or whether we should include the search for a solution to this problem in a move towards price truth” (Ministry of Planning, 1981, 27-28).

Since the early 1980s, the State has sought to respond to the deterioration in the internal balance by reducing its expenditure. This disengagement was to take several forms, including raising the prices of products subsidized directly by the CGC. At the end of December 1983, the government decided to increase the prices of these products significantly. However, this decision was quickly abandoned following the bread riots of January 1984. With the adoption, in 1986, of a Structural Adjustment Program (SAP) negotiated with international institutions, this disengagement became an integral part of a broader process of state withdrawal, reducing its role and economic weight.

This disengagement of the State should, among other things, involve restoring the truth about the prices of subsidized products and restructuring the CGC. However, fearing that such a measure would provoke social unrest, the state opted for a gradual approach, gradually increasing the prices of basic products (Makhlouf, 2017). Since the mid-1980s, a reform of the CGC has been underway with the aim of containing the economic cost of the subsidy in line with the country's financial capacities (1% of GDP, in the medium term). One of the solutions proposed was to limit the Fund's scope of intervention by reducing the number of subsidized products. Following the example of meats (1984) and fertilizers (mid-1990s), sugar was taken out of the CGC's fold in 2000, and CGC interventions were essentially limited to basic products (cereals and vegetable oils) intended for modest and middle-income segments of the population. At the same time, successive and progressive adjustments to the prices of compensated products were introduced, with the aim of bringing the prices of these products closer to their real levels and gradually converging towards true prices. By way of illustration, wheat compensation fell from 15.34 dinars/quintal in 1996 to 8.02 dinars/quintal in 2004. Overall, over the period 1986-2005, compensation expenditure was kept relatively under control. They fell from an annual average of 270.6 MD in 1986-1990 to 236.6 MD in 2001-2005, a drop of around 15%. In addition, CGC spending accounted for 0.6% of GDP in 2005, compared with 3.8% in 1985. As a proportion of government expenditure, the Fund's expenses, which represented 9.6% of total expenditure and 20.8% of management expenditure in 1985, were down to 1.8% and 3.7% respectively in 2005. This policy has benefited from a downward trend in world agricultural prices, if not from moderate increases. Although cereal and oil imports grew steadily, the Fund's expenses were kept relatively under control. As a result, the Fund was able to contribute to preserving the purchasing power of the poorest segments of society. The maintenance of compensated food prices has largely contributed to controlling inflation, especially during the period 1995-2005.

Table 2 : Evolution of CGC expenditure, 1986-2005 in million dinars (MD)

Produits	1986 - 1990		1991 -1995		1996 - 2000		2001 - 2005	
	MD	%	MD	%	MD	%	MD	%
Cereals and derivatives	161,9	59,9	195	63,7	212,6	68,0	160,4	67,8
Vegetable oils	32,2	11,9	42,3	13,8	60,8	19,4	54	22,8
Milk	21,5	7,9	15,7	5,1	18,7	6,0	7,3	3,1
Sugar	23,6	8,7	22,6	7,4	6,8	2,2	0	0
Other	31,4	11,6	30,5	9,9	13,9	4,4	14,9	6,3
Total	**270,6**	**100**	**306,1**	**100**	**312,8**	**100**	**236,6**	**100**

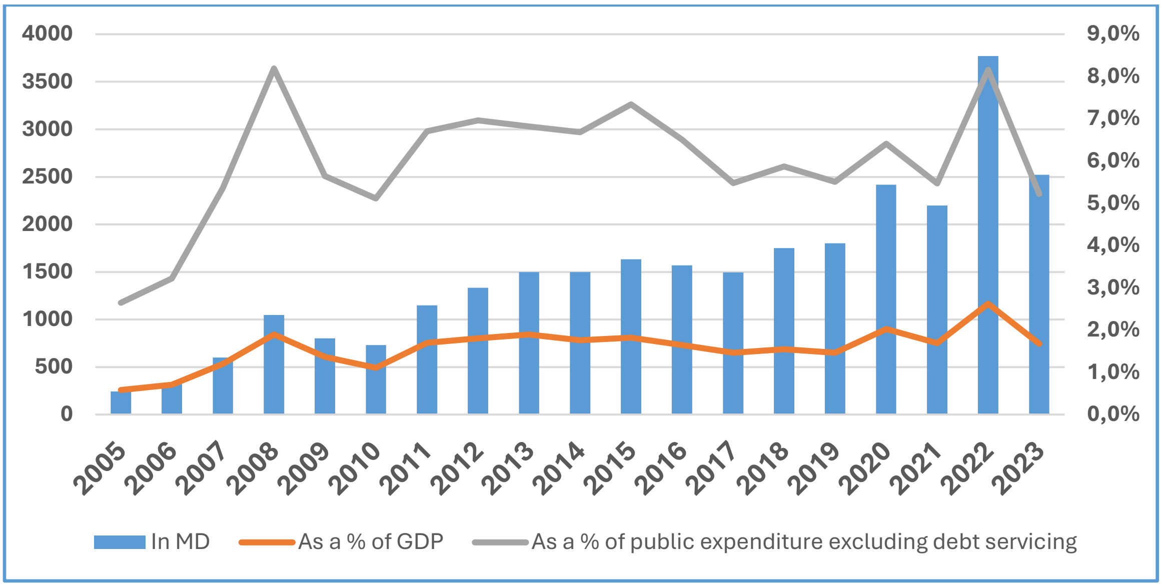
***Source:* Central Bank of Tunisia**

In 2006-2008, the world experienced a real food crisis due to the unprecedented rise in world prices for basic agricultural products. In Tunisia, this rise led to an increase in the food bill and a sharp rise in GSC expenditure (Akkari and Jouili, 2010). Between 2005 and 2008, import prices for basic foodstuffs rose considerably, and the bill was partly passed on to consumer prices. Between 2007 and 2008, the general consumer price index rose by 5.7%, cereals by 9.4% and dairy products by 14.6%. This partial absorption of the shock by inflation led to an escalation in GSC spending. The sharp rise in prices led to a rapid increase in GSC intervention, which reached 600 MD in 2007, compared with 243 MD in 2005. With prices continuing to soar in 2008, this figure rose to 1,048 MD, including 873 MD for cereals alone. For the same year, the compensation effort absorbed 2.5% of GDP, a rate corresponding to that of the late 1970s and early 1980s.

Over the same period, the quantities imported, and therefore eligible for subsidies, increased significantly, particularly for cereals and vegetable oils. Between 2004 and 2008, the quantities of cereal imported rose by over 50%, and those of vegetable oils by around 40%. So, while the spectacular increase in CGC expenses may appear to be linked to soaring world prices, it is also rooted in Tunisia's situation of food dependency, particularly for basic foodstuffs, and reflects the place and role assigned to agriculture in the accumulation process (Akkari and Jouili, 2010, Jouili, 2021).

Towards the end of 2008, the rise in world prices for agricultural products abated, allowing CGC expenditure to fall (900 MD in 2009). However, as instability and strong fluctuations are a fundamental characteristic of world markets for agricultural products, subsidy expenditure resumed an upward trend from 2010, reaching 1,800 MD in 2019 and 2,523 MD in 2023. This increase is largely due to the devaluation of the Tunisian dinar, whose value against the dollar fell by almost 89% between 2010 and 2023.

Figure 1 : Evolution of CGC expenditure (2005-2023)



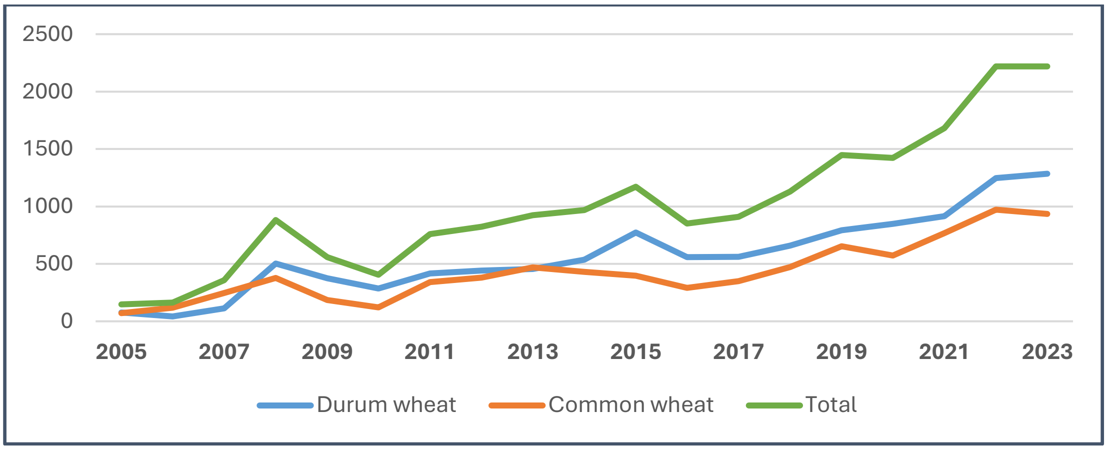
Source: drawn up from BCT data

While during the 1970s, the surges in world prices occurred in a context of relatively abundant financial resources (including those linked to oil revenues), enabling the State to cope with any increase in compensation expenditure, the most recent increases have taken place in a situation characterized by a tendency for the State's own resources to dwindle (Jouili, 2021).

3. Explanatory factors: case of wheat consumption subsidies

In 2023, wheat consumption subsidies (durum and common) absorbed 2,220 million dinars, or 88% of total CGC expenditure, compared with 147 million dinars in 2005, or 60% of total subsidy expenditure. Over the entire 2005-2023 period, wheat subsidies recorded an average annual growth rate of 16% and represented on average almost 70% of total subsidy expenses. This situation partly reflects the importance of wheat (and cereals in general) in the food intake of Tunisians, particularly the poorer categories.

Figure 2 : Evolution of wheat subsidy in millions of dinars (2005-2023)



Source: Cereals Office

The amount of state budget allocations to compensate the price of cereal-based food products varies from year to year, and clearly depends on several variables. Specifically, the unit subsidy for wheat is determined by the difference between the farm-gate price and the transfer price for local wheat, and by the difference between the import price and the transfer price for imported wheat. Thus, for both durum and soft wheat, the total annual subsidy can be estimated using the following expression:

$$S = (P_m * N - P_c) * Q_m + (P_p - P_c) * Q_l$$

With:
S : Annual subsidy amount
P_m: Annual import price in dollars
N: Average annual exchange rate (USD/TND)
P_c : The transfer price, which represents the price applied by the Office des Céréales to supplies of durum and soft wheat to millers.
Q_m : Quantity of imported wheat eligible for subsidy.
P_p : Producer price, which represents the price paid by the Office des Céréales to farmers.
Q_l : Quantity of local wheat eligible for subsidy.

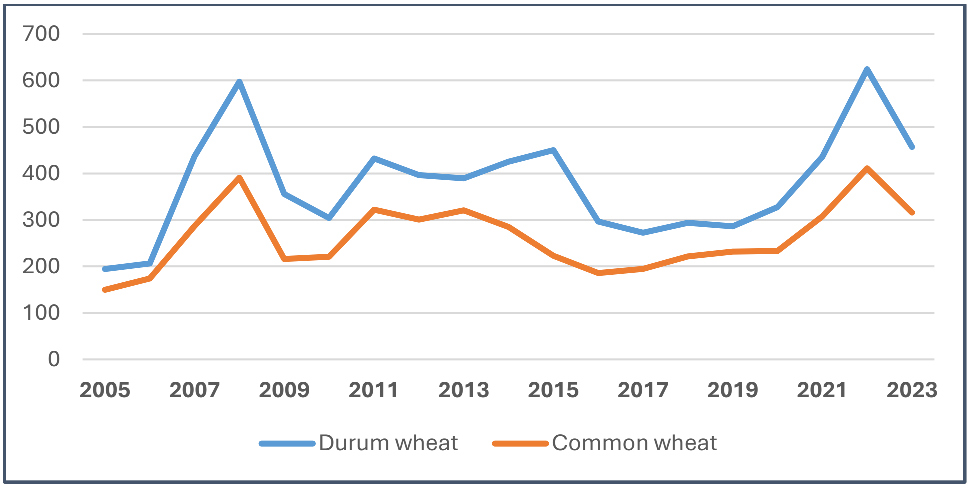
Thus, in addition to world prices, the annual amount of the wheat subsidy depends on a multitude of variables, including subsidized quantities (imported and local), the transfer price, the farm-gate price and the exchange rate.

3.1. World Prices and Exchange Rates

Characterized by high volatility and an upward trend, world grain prices are bound to affect subsidy expenditure in Tunisia via the imported component eligible for subsidy (Lajimi et al 2016). Thus, under the hypothesis that all other things are equal, any rise in world wheat prices contributes to an increase in compensation costs and, conversely, a fall in these prices should result in a reduction in subsidy expenditure.

Expressed in dollars, wheat import prices showed an upward trend between 2005 and 2023, rising from \$206 to \$457/ton for durum wheat and from \$150 to \$316/ton for soft wheat. However, inter-annual fluctuations are to be noted, with peaks (2008 and 2022) corresponding to crisis situations on world markets.

Figure 3 : Evolution of import prices in dollars/ton (2005-2023)



Source: Cereals Office

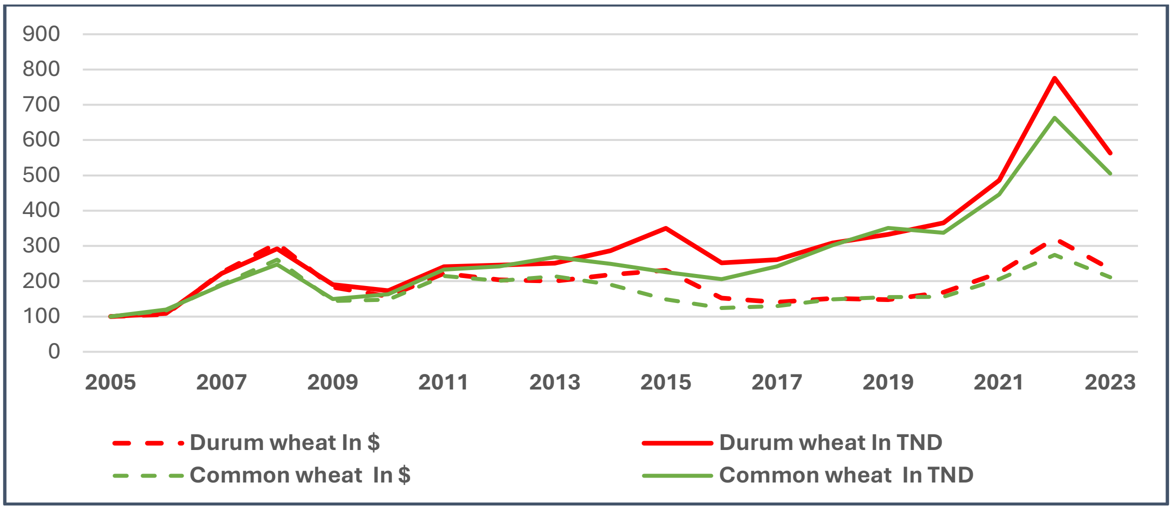
However, it is important to note that while increases in world prices have always led to a more than proportional increase in subsidy expenditure, this expenditure has only fallen slightly

(2009, 2016) or even risen (2019, 2023) in years characterized by a downturn in world wheat prices. This can be partly attributed to the exchange rate effect.

In fact, the unit subsidy for imported wheat is calculated as the difference between the import price expressed in dinars and the transfer price. The import price corresponds to the price expressed in dollars after conversion using the exchange rate ($P_I = P_m * N$). Thus, all other things being equal, a downward (upward) variation in the exchange rate reflects an appreciation (depreciation) of the local currency. In the case of an appreciation, this monetary policy variable registers a negative inter-annual variation, thus lightening the “food bill” and providing an appreciable lever to curb any price surges. In the case of depreciation, it contributes to an increase in subsidy costs.

Between 2005 and 2023, the Tunisian dinar depreciated sharply. Indeed, the exchange rate of the Tunisian dinar against the US dollar rose from 1.297 D/$ in 2005 to 3.106 in 2023. This represents a depreciation of around 139%. The graph below shows that the gap between import prices denominated in dollars and those denominated in dinars for the two cereals is increasingly obvious, reflecting the sharp depreciation of the local currency.

Figure 4 : Evolution of wheat import price indices (100 in 2005)



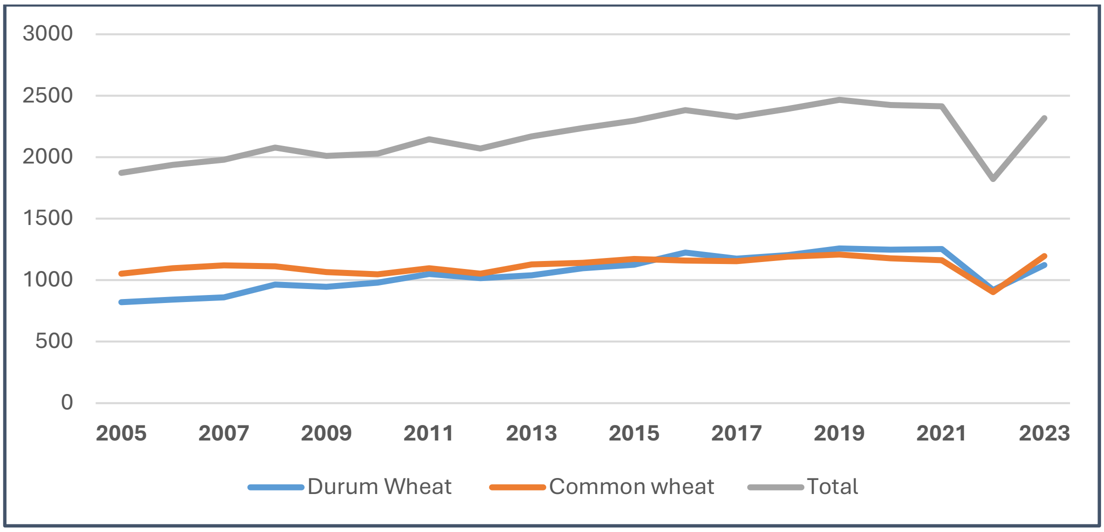
Sources: Authors' calculations based on data from the Central Bank and the Cereals Office

As a result, any rise in world prices is further reinforced by the depreciation of the dinar, resulting in a sharp increase in the subsidy burden. Conversely, the expected effect of a fall in world prices in terms of subsidy relief is partly offset, or even cancelled out, by the depreciation of the local currency.

3.2. Subsidized quantities

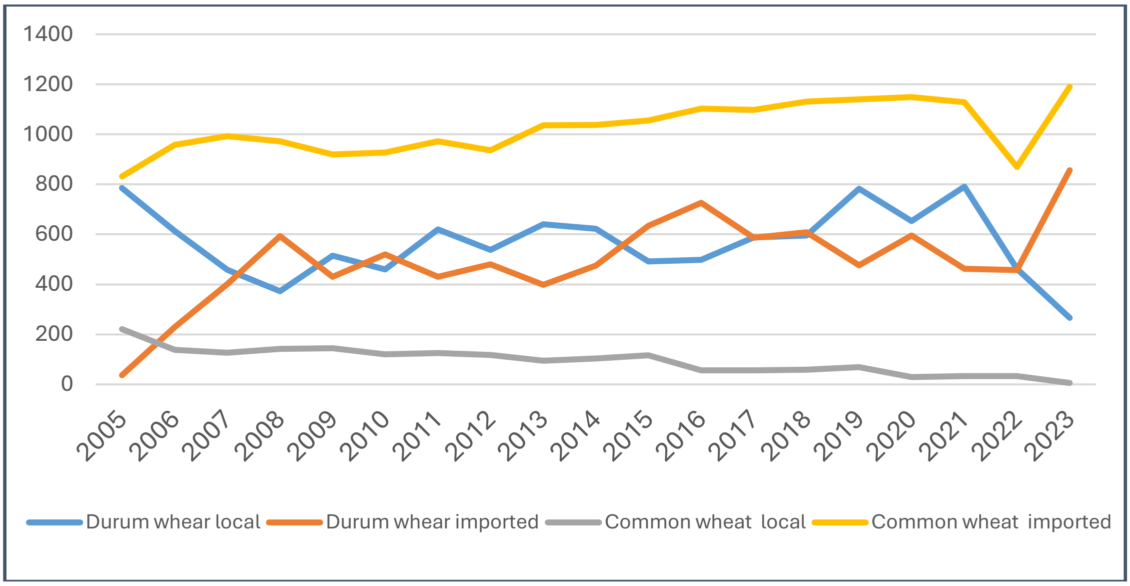
Quantities of wheat eligible for subsidies rose only slightly, at an average annual rate of 1.2% between 2005 and 2023 (1.8% for durum wheat and 0.7% for common wheat). In fact, cereal consumption per person rose from 182.6 kg/person/year in 2005 to 171 kg/person/year in 2020, so despite population growth, total consumption has remained relatively stable, which explains the small increase in quantities eligible for subsidies.

Figure 5 : Evolution of subsidized quantities of wheat (in thousand tonnes)



Source: Cereals Office

This relative stability in quantities eligible for subsidy has not, however, prevented an increase in compensation costs. An analysis of the structure of subsidized quantities suggests a few additional explanations.



The data show that subsidized quantities are largely imported, particularly for common wheat. This situation reflects Tunisia's heavy dependence on cereals. Indeed, over the last five years, Tunisia's dependence on common wheat consumption has averaged 95%, peaking at 98% in 2020. For durum wheat, Tunisia is 46% dependent on foreign suppliers, over an average of 5 years. In 2020, 47% of durum wheat sold on the local market was imported. Under these conditions, the rise in world prices, reinforced by the depreciation of the dinar, can only further increase the burden of compensation.

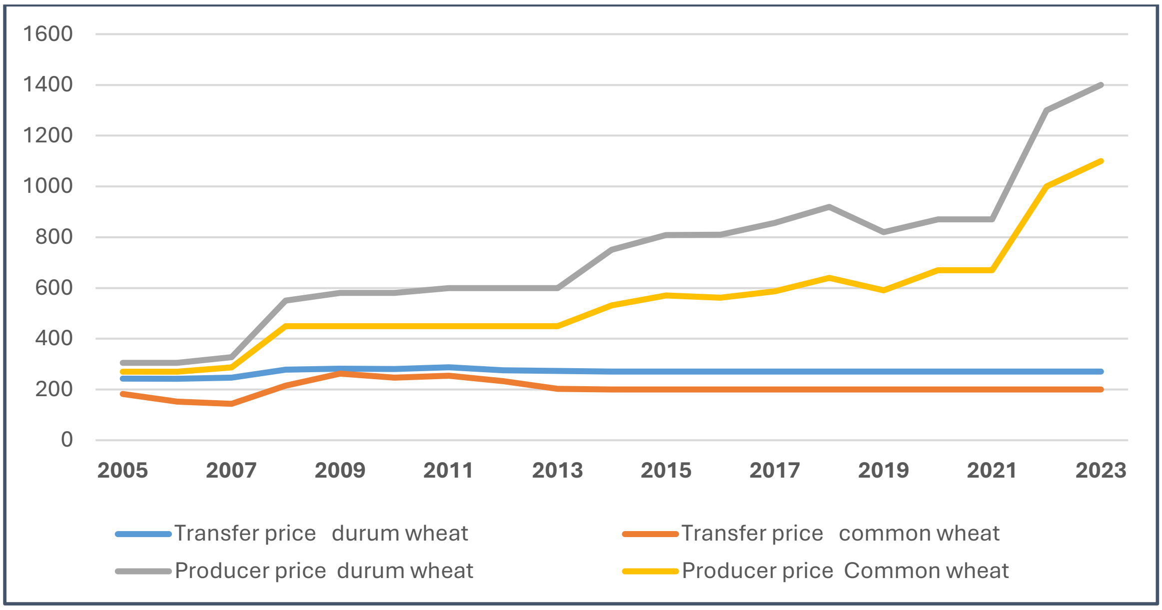
While the spectacular increase in the expenses of the CGC appears to be directly linked to the surge in world prices, it has its origins in Tunisia's food dependency, particularly where basic foodstuffs are concerned. While compensation expenditure is linked to the import prices of subsidized products, it also depends on the quantities eligible for compensation. These are largely determined by the quantities imported and, ultimately, by the capacity of domestic production to satisfy the population's consumption.

3.3. Transfer price and producer price

The transfer price applied by the Office des Céréales, for its part, shows a quite notorious variability. All other things being equal, any upward variation in this variable can be interpreted as a reduction in the price support policy, the counterpart of which is inevitably passed on to the consumer. Conversely, any fall in the transfer price implies an additional charge in terms of subsidy.

The producer price affects the amount of subsidy allocated to the quantity of local wheat. Since the other variables are assumed to be unchanged, an increase in the producer price results in a higher subsidy charge. Conversely, a downward variation in this price reduces the compensation expense.

Figure 6 : Evolution of producer prices and wheat transfer prices in dinar/ton



Between 2005 and 2023, the transfer price did not change significantly for either cereal. What's more, since 2014 this price has remained unchanged at 270.14 dinars/ton for durum wheat and 200.49 dinars/ton for soft wheat. Faced with the increase in world wheat prices, the public authorities are faced with two alternatives: either pass on this increase to consumers by raising the transfer price and therefore consumer prices or accept an increase in compensation costs. It is the second option which seems to have been chosen to avoid any inflationary pressure with its repercussions on household purchasing power.

Over the same period, production prices for durum and common wheat rose by an average of almost 8% a year, contributing somewhat to the increase in subsidy expenditure. However, in real terms, these prices have tended to fall. The main reason for this is the importance of cereal products in the human diet, and therefore in labor costs. The need to keep wage costs and inflation under control, to support a more open economy that is more exposed to foreign competition, limits the increase in producer prices for basic agricultural products, in this case cereals. Otherwise, in revising producer prices upwards, the State constantly must consider two constraints: the first relates to controlling wages, the second to controlling the deficit of the Caisse Générale de Compensation. Producer price increases for agricultural products, particularly cereals, will have to be kept within the limits of wage increases and the CGC deficit, which are deemed tolerable for macro-economic balances.

4. Econometric analysis

Numerous econometric models have been developed to examine the long-term cointegration relationship in the time series. These include the work of Engle and Granger (1987), Phillips and Hansen (1990), Johansen (1988), etc. In our study, we opt for the ARDL model (Autoregressive Distributed Lag Model), also known as the autoregressive staggered lag model. This model was developed by Pesaran (1997), Pesaran and Smith (1998), Pesaran et al. (2001). Our choice is justified by the advantages that this model offers over the other models mentioned above. Firstly, it allows us to simultaneously estimate the short- and long-term parameters of the variables under study.

Using the ARDL approach, the model is written as follows:

$$logS = f\left(logQ_m\, , logQ_l\, , logP_p\ \ , logP_m\, , logP_c\, , N\ \right)$$

With:
S : Annual subsidy amount
P_m: Annual import price in dollars
N: Average annual exchange rate (USD/TND)
P_c : The transfer price
Q_m : Quantity of imported wheat eligible for subsidy.
P_p : Producer price
Q_l : Quantity of local wheat eligible for subsidy.

4.1. Selection of the ARDL model

4.1.1. Optimal delay

The optimal order of delays for the ARDL model can be selected using the AKAIKE (AIC) or SCHWARZ (SC) information criterion, which are generally inferior to the other criteria. Table 2 below presents the test results for the optimal lag selection for the two models, which are lagged by an order of 2.2 for the endogenous variable and the exogenous variables in the first “common wheat” model and by an order of 2.1 for “durum wheat”.

Table 3 : optimal delay choice

Models	Optimal Delay
Common wheat	**2,2**
Durum wheat	**2,1**

4.1.2. ARDL model estimation

Model 1: Common wheat

Table 4 : Estimation of the ARDL model "Common wheat"

Endogenous variable : $logS$ Model : ARDL (2, 0, 0, 1, 0, 2, 0)			
Variable	Coefficient	T-Statistic	Prob. *
$logS$ (-1)	0.374433	6.402561	0.0001
$logS$ (-2)	-0.210125	-4.040567	0.0024
$logQ_m$	0.653054	11.41702	0.0000
$logQ_l$	0.174386	2.298549	0.0444
$logP_p$	-0.455704	-1.614356	0.1375
$logP_p$ (-1)	1.103318	2.904494	0.0157
$logP_m$	1.093901	7.528369	0.0000
$logP_c$	0.601258	1.605967	0.1394
$logP_c$ (-1)	-1.838273	-4.639917	0.0009
$logP_c$ (-2)	1.281550	4.415467	0.0013
N	0.183111	3.983780	0.0026
C	-4.990732	-6.548211	0.0001

Model 2: durum wheat

Variable endogène : $logS$ Modèle : ARDL (1,1,0,0,1,1,0)			
Variables	Coefficients	T-stat	Proba
$logS$ (-1)	0.150	0.63	0.53
$logQ_m$	0.276	1.55	0.14
$logQ_m$ (-1)	0.598	3.68	0.003
$logQ_l$	-0.14	-0.67	0.51
$logP_p$	0.705	1.00	0.33
$logP_m$	1.048	3.21	0.007
$logP_m$ (-1)	-0.205	-0.57	0.57
$logP_c$	-1.647	-0.88	0.39
$logP_c$ (-1)	2.33	1.44	0.17
N	0.064	0.58	0.57
C	-5.63	-2.00	0.06
R^2 =0.97 prob(f-stat) =0.000 dw=1.74			

The results of the ARDL model (1,1,0,0,0,1,0) reveal that subsidies are mainly influenced by the quantity imported after a time lag ($logQ_m$) and by the import price ($logP_m$) immediately. More precisely, an increase in the quantity imported leads to an increase in subsidies after a certain time lag, while an increase in the import price leads to an immediate increase in subsidies. In contrast, other variables such as local quantity ($logQ_l$), producer price ($logP_p$), transfer price ($logP_c$) and exchange rate ($\boldsymbol{N}$) do not have a significant impact on subsidies in this model. However, it is important to note that the model may not detect certain hidden effects of these variables. For example, government policies, external economic shocks or structural changes in the market could indirectly influence subsidies without being directly captured by the model's coefficients. In addition, complex interactions between variables not considered in this model could also play a crucial role in determining subsidies. Therefore, although the model provides useful insights, it is essential to consider potential limitations and unobserved effects for a more complete economic analysis.

4.1.3. Bound test

Model : « commonn wheat »				
Test statistique	Valeur	Significativité	I (0)	I (1)
F-statistique	92.48	10%	1.99	2.94
K	6	5%	2.27	3.28
		1%	2.88	3.99

Model : « durum wheat »				
Test statistique	Valeur	Significativité	I (0)	I (1)
F-statistique	6.99	10%	1.99	2.94
K	6	5%	2.27	3.28
		1%	2.88	3.99

For the two types of wheat (common and durum) respectively, the bounds tests show F-statistics well above the upper critical values I (1) at all the significance levels considered (1%, 5% and 10%). Consequently, it can be concluded that cointegration relationships exist in both cases.

4.2. Dynamics of coefficients

4.2.1. Error Correction Model (ECM) regression

In our case, the speed of adjustment towards long-term equilibrium is 83.5% for soft wheat and 84% for durum wheat. This means that any deviation of subsidies from their equilibrium level is quickly corrected in the following period.

Variables	Model : « common wheat »		
	Coefficient	T-stat	Prob
D ($logS$ (-1))	0.210	7.98	0.000
D ($logP_p$)	-0.455	-3.23	0.008
D ($logP_c$)	0.601	3.585	0.005
D ($logP_c$ (-1))	-1.281	-8.860	0.000
Cointégration eq (-1)	-0.835	-35.464	0.000

Variables	Model « durum wheat »		
	Coefficient	T-stat	Prob
D($logQ_m$)	0.276	3.123	0.008
D($logP_m$)	1.048	7.649	0.000
D($logP_c$)	-1.647	-1.831	0.092
Cointégration eq (-1)	-0.84	-9.41	0.000

4.2.2. Long term relationship

The aim of estimating the long-term relationship is to identify showing how the explanatory variables affect the dependent variable over the long term.

The rewritten equilibrium equation for the common wheat is:

$$logS = +0.7815 * logQ_m + 0.287 * logQ_l + 0.7749 * logP_p + 1.3090 * logP_m - 0.0533 * logP_C + 0.2191 * N - 5.9720$$

Analysis of the subsidy equilibrium equation shows several significant effects of the variables studied. Firstly, the quantity imported ($logQ_m$) has a positive coefficient of 0.7815, which means that a 1% increase in the quantity imported leads to a 0.78% increase in subsidies. This suggests that when imports increase, the state must increase subsidies to support consumers against imported products, probably to compensate for pressure on local prices. On the other hand, the local quantity ($logQ_l$) has a positive coefficient of 0.2087. A 1% increase in local subsidized quantity leads to a 0.21% increase in subsidies.

Similarly, the producer price ($logP_p$), with a coefficient of 0.7749, shows that when the producer price increases by 1%, subsidies increase by 0.77%. This can be explained by the fact that, faced with rising production costs, the State is increasing the producer price while at the same time bearing a heavier compensation burden. As for the import price ($logP_m$), a coefficient of 1.3090 indicates that a 1% increase in import prices leads to a 1.31% reduction in subsidies. This suggests that the government adjusts subsidies in line with changes in world prices. The transfer price ($logP_C$) has a coefficient of -0.0533, which shows that a 1% increase in consumer prices leads to a slight 0.05% reduction in subsidies. An increase in world prices can be passed on to consumers in the form of higher transfer prices and therefore higher consumer prices. The exchange rate (N) also has a positive effect of 0.2191, meaning that a 1% depreciation in the exchange rate leads to a 0.22% increase in subsidies. Although the effect is moderate, it confirms the fact that the impact of world prices on subsidy spending is reinforced by the depreciation of the local currency. Finally, constant (C) has a value of -5.9720, representing an autonomous contribution to subsidies, even in the absence of variations in the other variables.

For durum wheat, the long-run equilibrium equation is:

$$logS = 1.0300 * logQ_m - 0.1754 logQ_l + 0.8310 * logP_p + 0.9918 logP_m + 0.8142 * logP_c + 0.0764 * N - 6.6330$$

The model reveals some interesting relationships between subsidies and explanatory variables. First, the coefficient on $logQ_m$ (imported quantity) is 1.03, indicating that a 1% increase in imports leads to a 1.03% increase in subsidies, reflecting the strong dependence of subsidies on imported wheat. On the other hand, LOGQL (local quantity) has a negative coefficient of -0.1754, but it is not statistically significant (Prob=0.551), suggesting that local production has little or no impact on subsidies.

Regarding prices, the producer price ($logP_p$) has a coefficient of 0.831, showing that a 1% increase in the production price leads to a 0.83% increase in subsidies. Similarly, import price ($logP_m$) has a coefficient of 0.991, indicating an almost complete transmission of world price shocks to subsidies. Paradoxically, transfer price ($logP_c$) has a coefficient of 0.814, showing that a rise in this price leads to a significant increase in subsidies. This result can be attributed to the inherent limitations of the estimation model. Finally, the exchange rate (N) has a positive but low elasticity (0.076), indicating a limited impact of currency fluctuations on subsidies, although indirect effects via import prices are possible.

4.3. Residue diagnostics

Diagnosis of the residuals for the two models, common and durum wheat, reveals key information concerning the validity of the adjustments. For the common wheat model, the heteroskedasticity test indicates that there is no problem with non-constant error variance, with a p-value of 0.25, suggesting stable variance in the residuals. However, the correlation test (LM Test) shows a p-value of 0.001, indicating a strong correlation between the errors, which could indicate an incorrect specification of the model or the need to include other explanatory variables. The normality test (Jarque-Bera) with a p-value of 0.77 shows that the residuals follow a normal distribution, which is a good indicator of the validity of the model in this respect. In terms of stability, the CUSUM and CUSUM Squares tests validate the constancy of the coefficients, suggesting that the model remains stable over time. For the durum wheat model, the results are also reassuring. The heteroskedasticity test indicates a homogeneous variance in the residuals, with a p-value of 0.30. In addition, the correlation test showed a p-value of 0.51, indicating an absence of significant correlation between the errors, which is favorable to the quality of the model. The normality test also showed a p-value of 0.59, confirming that the residuals follow a normal distribution. As with the soft wheat model, the CUSUM tests confirm the stability of the model. In summary, although both models show acceptable stability and normality of residuals, the durum wheat model appears to be better specified, with no significant correlation between errors, making it more robust than the soft wheat model.

4.4. Causality Test

Firstly, the causality LOGSUB → LOGQM (subsidies causing quantities imported) is significant (p-value = 0.0341), suggesting that an increase in subsidies can lead to an increase in imports. This can be interpreted as a policy to compensate imported products to maintain their competitiveness against subsidized local products. A similar relationship is found with LOGSUB → LOGQL (subsidies causing local production), where an increase in subsidies could stimulate local production, reducing the competitive pressure exerted by imports (p-value = 0.0058). The test also shows that LOGPM → LOGSUB (import prices causing subsidies) is significant (p-value = 0.0139), indicating that when import prices rise, the state adjusts subsidies to maintain consumer purchasing power. Similarly, LOGPC → LOGSUB (consumer price causing subsidies) is also valid (p-value = 0.0064), reflecting a policy of supporting subsidies in the face of rising prices to protect consumers, particularly during periods of domestic inflation.

Other significant relationships between the variables were also identified. The LOGPP → LOGQL (output prices causing local production) test is significant (p-value = 0.0018), indicating that an increase in output prices of local goods may encourage local production. Another significant relationship is TC → LOGQL (exchange rate causing local production) with a p-value of 0.0003, suggesting that a depreciation of the exchange rate can stimulate local production, making exports more competitive and reducing the competitiveness of imports. Furthermore, LOGPM → LOGPP (import prices causing output prices) is significant (p-value = 0.0206), indicating that higher import prices directly influence local output prices, due to the higher costs of imported raw materials. Finally, LOGPC → LOGPP (consumer prices causing producer prices) is also valid (p-value = 0.0381), suggesting that an increase in consumer prices leads to an increase in producer prices, probably due to the necessary adjustment by producers to increased costs to maintain their profitability. These relationships underline the importance of adjusting public policies in response to price fluctuations, whether linked to imports, production prices or the exchange rate, to support both local producers and consumers

5. Conclusion

Since it was set up, the Caisse Générale de Compensation has played an important role in controlling inflation and safeguarding the purchasing power of the poorer sections of the population. From this point of view, its abolition cannot take place without the risk of social upheaval. At the same time, budgetary constraints make it difficult, if not impossible, to continue the subsidy policy in its current form. Reform is therefore essential.

As we have shown, the surge in compensation expenditure cannot be attributed solely to soaring world prices. Rather, it is the result of the combined intervention of several variables which are simply the expression of the economic policies implemented. These include the exchange rate as a monetary policy variable, the country's food dependency, producer prices as an agricultural policy variable and transfer prices reflecting wage policy choices. In this context, the abolition of the Fund and the adoption of a targeting policy may in turn lead to an increase in the budgetary burden and a worsening of poverty and inequality (INS and CERES 2019).

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ANNEX

Model : « Common wheat »

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGQM	0.781454	0.046704	16.73189	0.0000
LOGQL	0.208673	0.083547	2.497679	0.0316
LOGPP	0.774943	0.445363	1.740026	0.1125
LOGPM	1.308977	0.146241	8.950795	0.0000
LOGPC	0.053291	0.485159	0.109843	0.9147
TC	0.219113	0.063810	3.433828	0.0064
C	-5.971980	0.662716	-9.011366	0.0000

EC = LOGSUB - (0.7815*LOGQM + 0.2087*LOGQL + 0.7749*LOGPP + 1.3090 *LOGPM + 0.0533*LOGPC + 0.2191*TC - 5.9720)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	92.48019	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	6.761458	Prob. F(2,8)	0.0191
Obs*R-squared	13.82267	Prob. Chi-Square(2)	0.0010

ARDL Error Correction Regression
Dependent Variable: D(LOGSUB)
Selected Model: ARDL(2, 0, 0, 1, 0, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 12/11/24 Time: 21:59
Sample: 2000 2023
Included observations: 22

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGSUB(-1))	0.210125	0.026315	7.984965	0.0000
D(LOGPP)	-0.455704	0.140824	-3.235976	0.0089
D(LOGPC)	0.601258	0.167683	3.585683	0.0050
D(LOGPC(-1))	-1.281550	0.144628	-8.860998	0.0000
CointEq(-1)*	-0.835691	0.023564	-35.46450	0.0000

R-squared	0.986573	Mean dependent var	0.125452
Adjusted R-squared	0.983413	S.D. dependent var	0.232214
S.E. of regression	0.029907	Akaike info criterion	-3.984750
Sum squared resid	0.015205	Schwarz criterion	-3.736786
Log likelihood	48.83225	Hannan-Quinn criter.	-3.926337
Durbin-Watson stat	3.161934		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	92.48019	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

ARDL Error Correction Regression
Dependent Variable: D(LOGSUB)
Selected Model: ARDL(2, 0, 0, 1, 0, 2, 0)
Case 2: Restricted Constant and No Trend
Date: 12/11/24 Time: 21:59
Sample: 2000 2023
Included observations: 22

ECM Regression
Case 2: Restricted Constant and No Trend

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CointEq(-1)*	-0.835691	0.023564	-35.46450	0.0000

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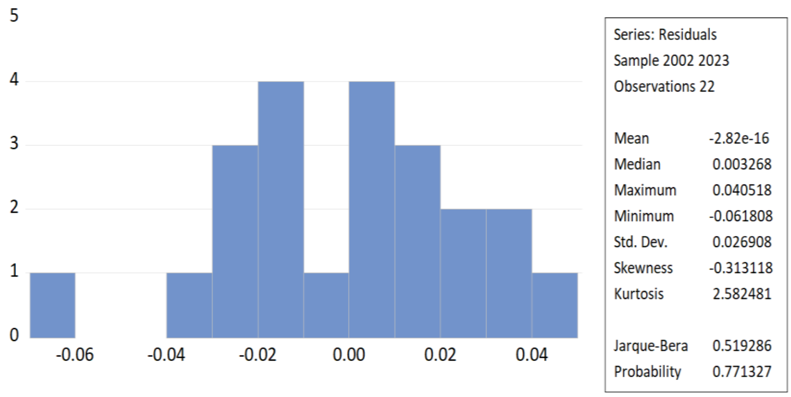
* p-value incompatible with t-Bounds distribution.

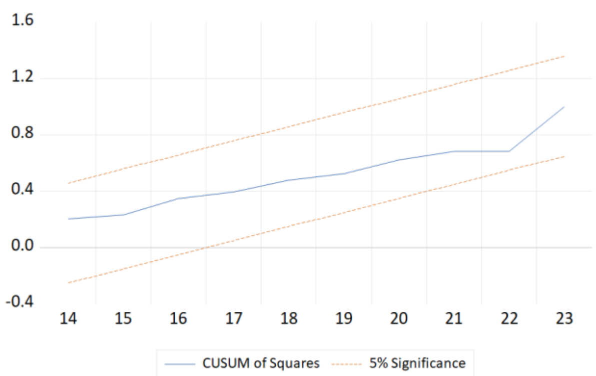
F-Bounds Test Null Hypothesis: No levels relationship

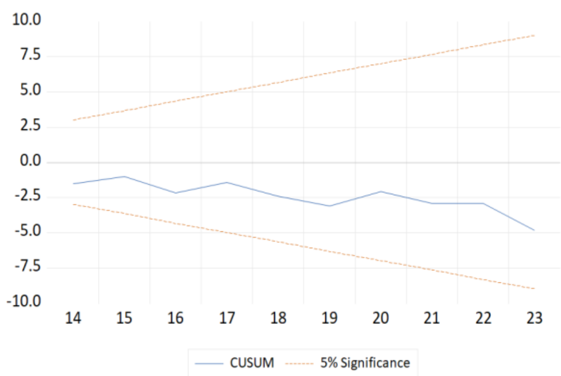
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	92.48019	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.500618	Prob. F(11,10)	0.2652
Obs*R-squared	13.70024	Prob. Chi-Square(11)	0.2500
Scaled explained SS	2.239708	Prob. Chi-Square(11)	0.9975







Pairwise Granger Causality Tests
Date: 12/11/24 Time: 22:12
Sample: 2000 2023
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGQM does not Granger Cause LOGSUB	22	0.26030	0.7738
LOGSUB does not Granger Cause LOGQM		4.14957	0.0341
LOGQL does not Granger Cause LOGSUB	22	2.94329	0.0799
LOGSUB does not Granger Cause LOGQL		7.07539	0.0058
LOGPP does not Granger Cause LOGSUB	22	1.01834	0.3822
LOGSUB does not Granger Cause LOGPP		1.57995	0.2348
LOGPM does not Granger Cause LOGSUB	22	5.55362	0.0139
LOGSUB does not Granger Cause LOGPM		3.11639	0.0703
LOGPC does not Granger Cause LOGSUB	22	6.89553	0.0064
LOGSUB does not Granger Cause LOGPC		2.13868	0.1484
TC does not Granger Cause LOGSUB	22	0.67204	0.5237
LOGSUB does not Granger Cause TC		1.85893	0.1862
LOGQL does not Granger Cause LOGQM	22	0.89475	0.4271
LOGQM does not Granger Cause LOGQL		3.16258	0.0680
LOGPP does not Granger Cause LOGQM	22	0.15078	0.8612
LOGQM does not Granger Cause LOGPP		0.91470	0.4195
LOGPM does not Granger Cause LOGQM	22	1.25958	0.3090
LOGQM does not Granger Cause LOGPM		4.65792	0.0244
LOGPC does not Granger Cause LOGQM	22	0.18344	0.8340
LOGQM does not Granger Cause LOGPC		5.02783	0.0193
TC does not Granger Cause LOGQM	22	0.08580	0.9182
LOGQM does not Granger Cause TC		1.22388	0.3187
LOGPP does not Granger Cause LOGQL	22	9.38539	0.0018
LOGQL does not Granger Cause LOGPP		0.67209	0.5237
LOGPM does not Granger Cause LOGQL	22	3.43457	0.0559
LOGQL does not Granger Cause LOGPM		0.12389	0.8843
LOGPC does not Granger Cause LOGQL	22	0.16898	0.8459
LOGQL does not Granger Cause LOGPC		0.92192	0.4167
TC does not Granger Cause LOGQL	22	13.7951	0.0003
LOGQL does not Granger Cause TC		0.19737	0.8227
LOGPM does not Granger Cause LOGPP	22	4.91908	0.0206
LOGPP does not Granger Cause LOGPM		3.27806	0.0625
LOGPC does not Granger Cause LOGPP	22	3.98279	0.0381
LOGPP does not Granger Cause LOGPC		0.28249	0.7574
TC does not Granger Cause LOGPP	22	0.90729	0.4223
LOGPP does not Granger Cause TC		3.23943	0.0643
LOGPC does not Granger Cause LOGPM	22	3.29415	0.0618
LOGPM does not Granger Cause LOGPC		2.97074	0.0783
TC does not Granger Cause LOGPM	22	0.88118	0.4324
LOGPM does not Granger Cause TC		1.01904	0.3820
TC does not Granger Cause LOGPC	22	0.02302	0.9773
LOGPC does not Granger Cause TC		0.48619	0.6233

Model : « Durum wheat »

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGQM	1.030034	0.424187	2.428256	0.0318
LOGQL	-0.175350	0.286193	-0.612698	0.5515
LOGPP	0.830995	0.731666	1.135757	0.2782
LOGPM	0.991787	0.514425	1.927953	0.0779
LOGPC	0.814220	1.582023	0.514670	0.6161
TC	0.076425	0.130500	0.585629	0.5690
C	-6.632988	2.608051	-2.543274	0.0258

EC = LOGSUB - (1.0300*LOGQM -0.1754*LOGQL + 0.8310*LOGPP + 0.9918 *LOGPM + 0.8142*LOGPC + 0.0764*TC - 6.6330)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	6.992942	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

ARDL Error Correction Regression
Dependent Variable: D(LOGSUB)
Selected Model: ARDL(1, 1, 0, 0, 1, 1, 0)
Case 2: Restricted Constant and No Trend
Date: 12/11/24 Time: 23:09
Sample: 2000 2023
Included observations: 23

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGQM)	0.276764	0.088601	3.123723	0.0088
D(LOGPM)	1.048323	0.137044	7.649544	0.0000
D(LOGPC)	-1.647808	0.899829	-1.831245	0.0920
CointEq(-1)*	-0.849510	0.090262	-9.411550	0.0000

R-squared	0.889892	Mean dependent var	0.057826
Adjusted R-squared	0.872507	S.D. dependent var	0.212388
S.E. of regression	0.075836	Akaike info criterion	-2.163724
Sum squared resid	0.109270	Schwarz criterion	-1.966247
Log likelihood	28.88283	Hannan-Quinn criter.	-2.114059
Durbin-Watson stat	1.748913		

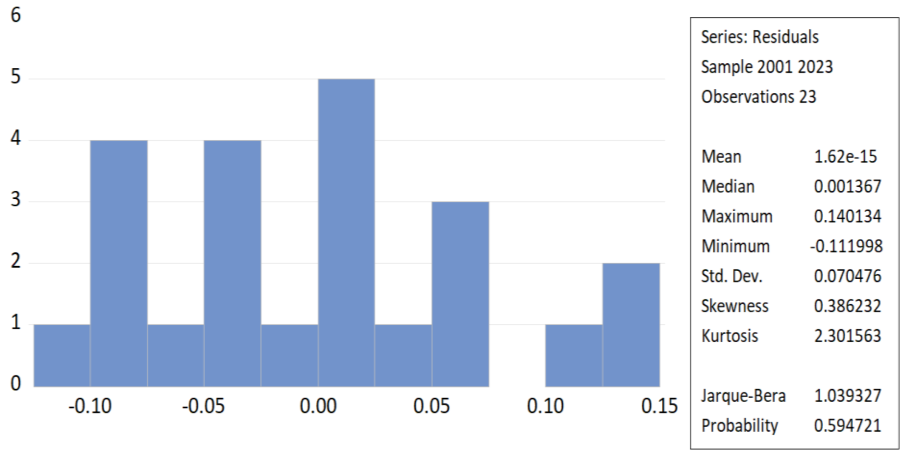
* p-value incompatible with t-Bounds distribution.

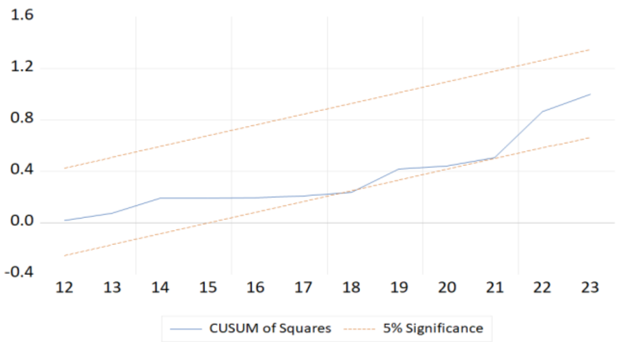
F-Bounds Test — Null Hypothesis: No levels relationship

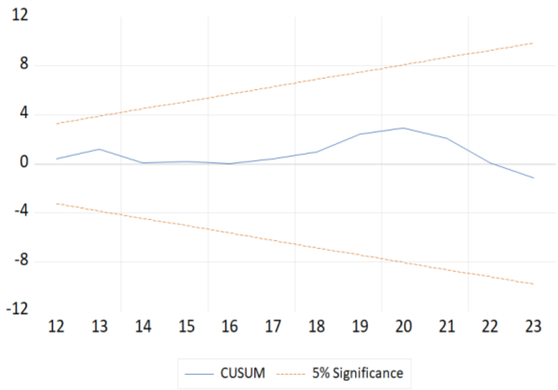
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.992942	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.308945	Prob. F(2,10)	0.7410
Obs*R-squared	1.338446	Prob. Chi-Square(2)	0.5121


Series: Residuals
Sample 2001 2023
Observations 23
Mean 1.62e-15
Median 0.001367
Maximum 0.140134
Minimum -0.111998
Std. Dev. 0.070476
Skewness 0.386232
Kurtosis 2.301563
Jarque-Bera 1.039327
Probability 0.594721


CUSUM of Squares
5% Significance


CUSUM
5% Significance

Pairwise Granger Causality Tests
Date: 12/11/24 Time: 23:18
Sample: 2000 2023
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LOGQM does not Granger Cause LOGSUB	22	7.68438	0.0042
LOGSUB does not Granger Cause LOGQM		2.60385	0.1032
LOGQL does not Granger Cause LOGSUB	22	2.03701	0.1611
LOGSUB does not Granger Cause LOGQL		1.04267	0.3740
LOGPP does not Granger Cause LOGSUB	22	2.87758	0.0839
LOGSUB does not Granger Cause LOGPP		0.70949	0.5059
LOGPM does not Granger Cause LOGSUB	22	8.76931	0.0024
LOGSUB does not Granger Cause LOGPM		4.53420	0.0264
LOGPC does not Granger Cause LOGSUB	22	0.88982	0.4290
LOGSUB does not Granger Cause LOGPC		4.95346	0.0202
TC does not Granger Cause LOGSUB	22	0.48454	0.6242
LOGSUB does not Granger Cause TC		3.43412	0.0559
LOGQL does not Granger Cause LOGQM	22	1.31662	0.2940
LOGQM does not Granger Cause LOGQL		1.17394	0.3330
LOGPP does not Granger Cause LOGQM	22	1.23759	0.3149
LOGQM does not Granger Cause LOGPP		1.58236	0.2343
LOGPM does not Granger Cause LOGQM	22	0.79248	0.4688
LOGQM does not Granger Cause LOGPM		4.22728	0.0323
LOGPC does not Granger Cause LOGQM	22	1.04787	0.3723
LOGQM does not Granger Cause LOGPC		1.35785	0.2837
TC does not Granger Cause LOGQM	22	1.25221	0.3109
LOGQM does not Granger Cause TC		0.62936	0.5449
LOGPP does not Granger Cause LOGQL	22	2.27283	0.1334
LOGQL does not Granger Cause LOGPP		0.16695	0.8476
LOGPM does not Granger Cause LOGQL	22	7.50797	0.0046
LOGQL does not Granger Cause LOGPM		0.29437	0.7487
LOGPC does not Granger Cause LOGQL	22	5.93672	0.0111
LOGQL does not Granger Cause LOGPC		7.58331	0.0044
TC does not Granger Cause LOGQL	22	0.51855	0.6045
LOGQL does not Granger Cause TC		0.50100	0.6146
LOGPM does not Granger Cause LOGPP	22	8.23392	0.0032
LOGPP does not Granger Cause LOGPM		2.60928	0.1027
LOGPC does not Granger Cause LOGPP	22	0.09409	0.9107
LOGPP does not Granger Cause LOGPC		1.10711	0.3532
TC does not Granger Cause LOGPP	22	0.68205	0.5189
LOGPP does not Granger Cause TC		4.22758	0.0323
LOGPC does not Granger Cause LOGPM	22	3.02641	0.0751
LOGPM does not Granger Cause LOGPC		3.46450	0.0547
TC does not Granger Cause LOGPM	22	0.91807	0.4182
LOGPM does not Granger Cause TC		1.73384	0.2064
TC does not Granger Cause LOGPC	22	0.11219	0.8945
LOGPC does not Granger Cause TC		1.81308	0.1933