An Econometrics Analysis of Foreign Demand for Egyptian Dried Onions

Mohamed A-E. Abd Elsamie [1], Salah M. S. Makled [2], Yosry A. Abdel Daim [3], Eman A-E. Ahmed[4]

ABSTRACT

The geographical distribution of Egyptian dried onion exports during the study period (2022-2024) reveals that the major importers of Egyptian dried onions are approximately 20 countries worldwide, importing approximately 92.4% of Egypt's average total exports during the same period. Germany ranks first in terms of Egyptian dried onion exports, with an average of approximately 347,967 tons, representing approximately 18.23% of Egypt's average exports during the same period, which amounted to approximately 19,086.67 tons. The Netherlands comes in second place, with Egypt's average exports to the Netherlands amounting to approximately 3,389.33 tons, representing approximately 17.76% of Egypt's average dried onion exports during the study period. The United States also ranks third in terms of its imports of Egyptian dried onions, averaging approximately 2,138.33 tons, representing approximately 11.20% of the average total Egyptian dried onion exports during the study period.

To estimate external demand for Egyptian dried onions for the import market (Q_{EX}), a statistical model was developed containing the most important determinants: (Egypt's export price to the importing country, the export price of competing countries, the population of the importing country, and the average per capita income of the importing country). Stepwise regression and a correlation matrix were used to eliminate the problem of multicollinearity. Several attempts were made to identify the most important statistical models that determined the quantity of Egyptian dried onion exports to the most important importing countries (Germany, the Netherlands, the United States, Japan, Belgium, Poland, and the United Kingdom).

Keywords: Dried onions, external demand, relative importance.

INTRODUCTION

Onions are one of the most important vegetable crops in Egypt. They are grown year-round in three seasons: winter, summer, and Nile. They are also grown as single-crops or intercropped. Given the vulnerability of agricultural crops to natural and climatic factors and their susceptibility to perishability, onion producers and consumers are exposed to price fluctuations. This negatively impacts production and marketing policies and the market shares of intermediaries. The drying industry of vegetable crops, particularly onions, is considered one of the most important food industries due to its unique advantages, including low production costs, reduced waste, preservation of nutritional value, light weight, and extended shelf life without the use of preservatives. This leads to improved food quality and safety, opening the door to exporting such dried crops in accordance with applicable international standards and measurements, in addition to the added value this industry can add. Despite this, Egyptian exports to countries around the world are characterized by instability. Therefore, this research aimed to identify the determinants of Egyptian onion exports, both fresh and dried.

RESEARCH PROBLEM

Despite the growing economic importance of Egyptian dried onions, Egyptian exports to countries around the world are characterized by instability on the one hand and sometimes a decline on the other, compared to competing countries. This is due to the varying tastes of foreign markets for Egyptian food commodities. Moreover, export prices are a key factor in determining the price elasticity of demand for major importing countries, determining whether the commodity is essential or a luxury for these markets. The research also examines the prices of countries competing with Egyptian dried onion exports, as well as the national income and population of importing countries.

RESEARCH OBJECTIVES

The research generally aims to identify the most important importing markets for Egyptian dried onions and to identify the determinants of Egyptian exports to these markets, based on data for the period (2005-2024). It also aims to identify the various elasticities of demand and their degrees, with the aim of incorporating them into export promotion policies.

RESEARCH METHOD AND DATA RESOURCES

To achieve the research objectives, the study relied on descriptive and quantitative analysis methods to describe and analyze the variables under study. Various statistical tools were used, including estimating percentages, averages, and relative importance, analyzing general trend models, and estimating multiple regression in the double logarithmic form by estimating external demand functions, using Excel and SPSS.

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[1]graduate student
[2] Prof. Emeritus of Agricultural Economics, Faculty of Agriculture, Ain Shams University
[3]Emeritus Professor of Food Science, Faculty of Agriculture, Ain Shams University.
[4] Prof of Agricultural Economics, National Research Center.

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The study also relied on secondary data sources: These include secondary data published from various sources, such as the Economic Affairs Sector, the Central Administration of Agricultural Economics - Ministry of Agriculture and Land Reclamation, and secondary data published on the Internet and the World Bank.

RESULTS AND DISCUSSION

Development in the quantity, export price, and value of Egyptian dried onion exports:

Development in the quantity of Egyptian dried onion exports:

It is clear from studying the indicators in Table (1) and Figure (1), that the quantity of Egyptian dried onion exports during the period (2005-2024) ranged from a minimum of about 8.59 thousand tons in 2013 to a maximum of about 21.89 thousand tons in 2011, with an average of about 14.55 thousand tons. By estimating the time trend equation in Table (2), the results of the statistical estimation during the period (2005-2024) show that the quadratic picture is the best picture from a statistical point of view, as it was shown that the quantity of Egyptian exports of dried onions during the period (2022-2024) was decreasing until it reached the highest quantity of about 8.59 thousand tons in 2013, then it took a decreasing trend with a statistically significant annual amount of about 0.14 thousand tons annually, representing about 0.97% of the average period (2014-2024), which amounted to about 14.41 thousand tons. The coefficient of determination (R^2) was approximately 0.37, meaning that 37% of the changes in Egyptian dried onion exports during the study period were due to time-dependent variables, with the remainder attributed to other variables not considered.

$$\hat{Y}_2 = 19.5 - 1.49\ X_i + 0.07\ X_i^2$$
$$(8.2)^{**}\quad (-2.9)^{**}\quad (3.07)^{**}$$
$$R^2 = 0.37 \qquad F = 4.89^{**}$$

Where: $\hat{Y}$: Estimated value of the dependent variable.

Xi = Time factor, where i is (1, 2, ..., 20).

The value in parentheses represents the calculated (T) value.

(R^2) is the coefficient of determination, (F) is the significance of the regression model.

** indicates the significance of the coefficient at the 1% level.

Source: Compiled and calculated from data in Table (1) of the study.

Table 1. Development of Egyptian dried onion export quantity, price, and value during the period 2005-2024

(Quantity: thousand tons, export price: $/ton, export value: million dollars)

Years	Export Quantity	Export Price	Export Value
2005	17.14	1511	25.90
2006	15.98	1396	22.31
2007	16.65	2043	34.01
2008	13.11	2868	37.61
2009	12.22	2879	35.18
2010	13.78	2298	31.67
2011	21.86	1633	35.69
2012	13.14	2536	33.32
2013	8.59	3028	26.01
2014	12.15	2830	34.39
2015	13.94	2632	36.69
2016	11.48	2616	30.03
2017	10.90	3275	35.70
2018	9.78	3195	31.24
2019	9.95	2980	29.65
2020	15.43	2633	40.63
2021	17.64	2962	52.27
2022	21.89	2769	60.61
2023	15.90	3036	48.26
2024	19.47	3398	66.17
Average	14.55	2625.90	37.37

Source: Compiled and calculated from the official website www.trademap.org

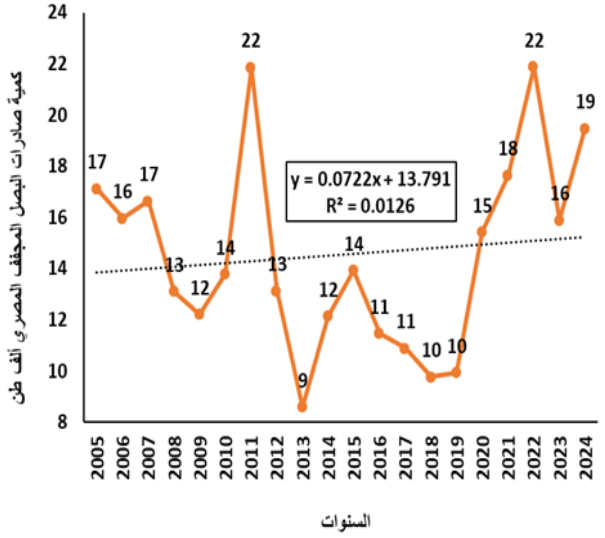

Fig. 1. Development of Egyptian dried onion exports in thousand tons during the period (2005-2024)
Source: Data from Table (1) of the study.

Development of the Egyptian Dried Onion Export Price:

A study of the indicators in Table (1), shows that the Egyptian dried onion export price during the period (2005-2024) ranged from a low of approximately $1,396/ton in 2006 to a high of approximately $3,398/ton in 2024, with an average of approximately $2,625.90/ton.

By estimating the time trend equation in Table (2), the statistical estimation results for the period (2005-2024) show that the linear model is the best model from a statistical standpoint, showing a statistically significant annual increase of approximately $69.53/ton per year, representing approximately 2.65% of the period's average of approximately $2,625.90/ton. The coefficient of determination (R^2) was about 0.51, which means that 51% of the changes in the Egyptian export price of dried onions during the study period are due to variables whose effect reflects the time factor, and the rest are due to other variables that were not taken into account.

$$\hat{Y}_2 = 1895.9 + 69.53\ X_i$$
$$(5.27)^{**} \quad (5.40)^{**}$$

R^2 = 0.51 F = 18.81 % annual change = 2.65%**

Where: Annual change rate = β / Average * 100

Ŷ: Estimated value of the dependent variable.

Xi = Time factor, where i is (1, 2, ..., 20).

The value in parentheses represents the calculated (T) value.

(R^2) is the coefficient of determination, (F) is the significance of the regression model.

** indicates the significance of the coefficient at the 1% level.

Source: Compiled and calculated from data in Table (1) of the study.

Development of the Value of Egyptian Dried Onion Exports:

A study of the indicators in Table (1), shows that the value of Egyptian dried onion exports during the period (2005-2024) ranged from a low of approximately $22.31 million in 2006 to a high of approximately $66.17 million in 2024, with an average of approximately $37.37 million.

By estimating the time trend equation in Table (2), the results of the statistical estimation for the period (2005-2024) show that the linear model is the best model from a statistical standpoint. It is shown that the value of Egyptian dried onion exports during the period (2022-2024) showed a statistically significant annual increase of approximately $1.38 million, representing approximately 3.69% of the average. The coefficient of determination (R2) was approximately 0.52, meaning that 52% of the changes in the value of Egyptian dried onion exports during the study period were due to time-dependent variables, while the remainder were due to other variables not taken into account.

$$\hat{Y}_3 = 22.9 + 1.38\ X_i$$
$$(6.1)^{**} \quad (4.4)^{**}$$

R^2 = 0.52 F = 19.31 % annual change = 3.69%**

Where: Annual change rate = β / Average * 100

Ŷ: Estimated value of the dependent variable.

Xi = Time factor, where i is (1, 2, ..., 20).

The value in parentheses represents the calculated (T) value.

(R^2) is the coefficient of determination, (F) is the significance of the regression model.

** indicates the significance of the coefficient at the 1% level.
Source: Compiled and calculated from data in Table (1) of the study.

Geographical Distribution of Egyptian Dried Onion Exports:

The above shows that Egypt ranks fourth in terms of its dried onion exports globally, with an average of approximately 19,090 tons, representing approximately 6.96% of the total global dried onion exports during the study period (2022-2024).

Table (3) shows the geographical distribution of Egyptian dried onion exports during the study period (2022-2024). It is clear that the top importers of Egyptian dried onions are approximately 20 countries worldwide, importing approximately 92.4% of Egypt's average total exports during the same period. Germany ranks first in terms of the quantity of Egyptian dried onions exported, with an average of approximately 347,967 tons, representing approximately 18.23% of Egypt's average dried onion exports during the same

period, which amounted to approximately 19,086.67 tons. The Netherlands came in second place, with Egyptian exports averaging approximately 3,389.33 tons, representing approximately 17.76% of Egypt's average dried onion exports during the study period.

The United States also ranks third in terms of its imports of Egyptian dried onions, with an average of approximately 2,138.33 tons, representing approximately 11.20% of the average total Egyptian dried onion exports during the study period. Japan, Indonesia, and Belgium ranked fourth to sixth, with average imports of approximately 1,679.0 tons, 1,298.67 tons, and 936.0 tons, representing approximately 8.80%, 6.90%, and 4.90% of the total Egyptian exports, respectively. The United Kingdom and Poland ranked seventh and eighth, with average imports of approximately 874.33 tons and 687.33 tons, representing approximately 4.58% and 3.60% of the total Egyptian exports, respectively. Côte d'Ivoire and Croatia ranked ninth and tenth, with their average imports of Egyptian dried onions amounting to approximately 492.33 and 374.67 tons, representing approximately 2.58% and 2.02% of the average total Egyptian dried onion exports during the study period.

From the above, it is clear that the ten aforementioned countries imported approximately 15,360.67 thousand tons, representing approximately 80.48% of the average total quantity of Egyptian dried onion exports during the study period (2022-2024).

Geographical Distribution of the Value of Egyptian Dried Onion Exports:

Table (4), shows the geographical distribution of the value of Egyptian dried onion exports during the study period (2022-2024). It is clear that the major importers of Egyptian dried onions are approximately 20 countries worldwide, importing approximately 92% of Egypt's average total exports during the same period. Germany ranks first in terms of the exported value of Egyptian dried onions, with an average of approximately $10,733.0 thousand, representing approximately 18.39% of Egypt's average exports during the same period, which amounted to approximately $58,350.33 thousand.

Table 3. Geographical distribution of Egypt's dried onion exports to the world's major countries, in thousand tons, during the period (2022-2024)

Importing Countries	2022	2023	2024	Average	relative importance
Germany	3878	2310	4251	3479.67	18.23
Netherlands	3376	3404	3388	3389.33	17.76
United States	3418	1184	1813	2138.33	11.20
Japan	1552	1297	2188	1679.00	8.80
Indonesia	719	1430	1747	1298.67	6.80
Belgium	1283	713	812	936.00	4.90
United Kingdom	1004	936	683	874.33	4.58
Poland	941	580	541	687.33	3.60
Côte d'Ivoire	825	240	412	492.33	2.58
Croatia	458	370	329	385.67	2.02
Senegal	187	421	232	280.00	1.47
Czech Republic	268	---	---	268.00	1.40
Philippines	302	359	134	265.00	1.39
Hungary	450	152	174	258.67	1.36
Russian Federation	393	159	145	232.33	1.22
Guatemala	96	277	242	205.00	1.07
Canada	213	224	162	199.67	1.05
Sweden	166	227	200	197.67	1.04
France	88	105	389	194.00	1.02
Ethiopia	205	280	26	170.33	0.89
Other Countries	2069	1227	1606	1455.33	7.62
World	21891	15895	19474	19086.67	100

Source: Compiled and calculated from the official website www.trademap.org

The Netherlands comes in second place, with Egypt's exports to the Netherlands averaging approximately $10,398.67 thousand, representing approximately 17.82% of the average total value of Egyptian dried onion exports during the study period. The United States also ranks third in terms of imports of Egyptian dried onions, with an average of approximately $6,406.67, representing approximately 10.98% of the average total Egyptian dried onion exports during the study period. Japan, Indonesia, and Belgium ranked fourth to sixth, with average imports of approximately $5,223.0, $4,089.67, and $2,825.33, representing approximately 8.95%, 7.07%, and 4.84%, respectively. The United Kingdom and Poland ranked seventh and eighth, with average imports of approximately $2,647.0 and $2,067.67, representing approximately 4.54% and 3.54% of the average total Egyptian exports. Côte d'Ivoire and Croatia ranked ninth and tenth, with average imports of approximately $1,471.33 and $1,169.33, representing approximately 2.52% and 2.00% of Egypt's total exports. From the above, it is clear that the ten aforementioned countries imported approximately $47,031.67 of dried onions, representing approximately 80.60% of the average total Egyptian dried onion exports during the study period (2022-2024).

To estimate the external demand for Egyptian dried onions for the importing market (QEX), a statistical model was developed that includes the most important determinants: (Egypt's export price to the importing country, the export price of competing countries, the population of the importing country, and the average per capita income of the importing country).

Table 4. Geographical distribution of the value of Egypt's dried onion exports to the world's most important countries, in millions of dollars, during the period (2022-2024)

Importing Countries	2022	2023	2024	Average	%
Germany	10739	7014	14446	10733.00	18.39
Netherlands	9349	10334	11513	10398.67	17.82
United States	9464	3595	6161	6406.67	10.98
Japan	4296	3938	7435	5223.00	8.95
Indonesia	1992	4342	5935	4089.67	7.01
Belgium	3553	2165	2758	2825.33	4.84
United Kingdom	2780	2841	2320	2647.00	4.54
Poland	2604	1762	1837	2067.67	3.54
Côte d'Ivoire	2285	730	1399	1471.33	2.52
Croatia	1267	1124	1117	1169.33	2.00
Senegal	519	1278	789	862.00	1.48
Philippines	836	1089	456	793.67	1.36
Hungary	1246	463	592	767.00	1.31
Czech Republic	741	---	---	741.00	1.27
Russian Federation	1089	482	492	687.67	1.18
Guatemala	265	842	822	643.00	1.10
France	242	318	1323	627.67	1.08
Sweden	459	688	681	609.33	1.04
Canada	591	680	550	607.00	1.04
Ethiopia	567	851	90	502.67	0.86
Other Countries	5729	3728	5458	4477.67	7.67
World	60613	48264	66174	58350.33	100

Source: Compiled and calculated from the official website www.trademap.org

Statistical description of the double logarithmic model:

Ln QEXi = β0 + β1 Ln Peg + β2 Ln P1 + β3 Ln P2 + β4 Ln P3 + β7 Ln P5 + β8 Ln I + β9 Ln POP + β5 Ln P3 + β6 Ln P4

Where: Q_{EXi} = the quantity of Egyptian exports to the importing country in tons.

Peg: Egypt's export price to the importing country.

P1: The export price of competing country 1 to Egypt.

P2: The export price of competing country 2 to Egypt.

P3: The export price of competing country 3 to Egypt.

P4: Export price of competing country 4 to Egypt.

P5: Export price of competing country 5 to Egypt.

I: Average income of the importing country.

POP: Population of the importing country.

By using both stepwise regression and a correlation matrix between the independent variables under study to eliminate the problem of multicollinearity, several attempts were made to identify the most important statistical models specific to the quantity of Egyptian exports to the major importing countries of Egyptian dried onions (Germany, the Netherlands, the USA, Japan, Belgium, Poland, and the United Kingdom). The estimation results were as follows:

1- German external demand function for Egyptian dried onions:

The results of the statistical analysis of the German demand function for Egyptian dried onions during the study period (2005–2024) show that a 10% increase in the price of Chinese dried onions to Germany leads to a 12.4% increase in the quantity of Egyptian dried onions to Germany, respectively. This reflects the clear competitiveness between Egyptian dried onions and Chinese dried onions.

$\ln Q_{ger} = 9.01 - 1.35 \ln P_{eg} + 1.24 \ln P_{China}$

(2.37)* (-4.12) (2.29)***

$R^2 = 0.50$ $Adj.R^2 = 0.44$ F = 8.53**

Where: Q_{ger}: Quntity of Egyptian dried onion exports to Germany in tons.

P_{eg}: Egypt's dried onion export price to Germany is $/ton.

P_{China}: China's dried onion export price to Germany is $/ton.

Source: Compiled and calculated from data in Table (1) of the study.

Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

This means that the derived elasticities are greater than one, and therefore represent a more elastic demand that is significantly affected by competitive prices.

Meanwhile, a 10% increase in the export price of Egyptian dried onions to Germany leads to a 13.5% decrease in the quantity of Egyptian dried onions exported to Germany. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is greater than one, and therefore represents an elastic demand. Therefore, it is an elastic demand, meaning that the quantity of exports is affected by the Egyptian export price. The significance of the model parameters was confirmed at the 0.01 level, as was the significance of the model as a whole. The results also indicated that approximately 44% of the changes in the quantity of Egyptian dried onion exports to Germany are due to the independent variables under study (Egyptian export price, Chinese export price), taking into account degrees of freedom.

2- The Netherlands External Demand Function for Egyptian Dried Onions:

The results of the statistical analysis of the Netherlands external demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to the Netherlands leads to a 6.4% decrease in the quantity of Egyptian dried onions exported to the Netherlands. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is less than one, and therefore represents inelastic demand. This means that the quantity of exports is not affected by the Egyptian export price.

$\ln Q_{Neth} = -131.55 - 0.64 \ln P_{eg} + 0.62 \ln_{China} + 5.03 \ln I_{Nethn}$

$R^2 = 0.71$ $Adj.R^2 = 0.66$ F = 13.15**

(-5.5) (-2.23)* (2.99)** (5.60)****

Where: Q_{neth}: Quantity of Egyptian dried onion exports to the Netherlands in tons.

P_{eg}: Egyptian dried onion export price to the Netherlands in dollars per ton.

P_{China}: China's dried onion export price to the Netherlands in dollars per ton.

I_{Nethn}: Netherlands gross domestic product in millions of dollars.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

While a 10% increase in the price of Chinese dried onions to the Netherlands leads to a 6.2% increase in the quantity of Egyptian dried onions exports to the Netherlands. This means that the derived cross-elasticity of demand for Egyptian dried onion exports is less than one, and therefore inelastic demand is not significantly affected by competitive prices.

Also, a 10% increase in the Netherlands national income leads to a 50.3% increase in the quantity of Egyptian dried onion exports to the Netherlands. This means that the derived income elasticity is greater than one, and therefore more elastic demand is significantly affected by income.

The model as a whole was found to be significant. The results also indicated that approximately 66% of the changes in the quantity of Egyptian dried onion exports to the Netherlands are due to the independent variables under study (Egyptian export price, Chinese export price, and Netherlands national income), taking into account degrees of freedom.

3- The USA Foreign Demand Function for Egyptian Dried Onions:

The results of the statistical analysis of the USA foreign demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to the USA leads to a 1.9% decrease in the quantity of Egyptian dried onions exported to the USA. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is less than one, and therefore inelastic demand, meaning that the quantity of exports is not affected by the Egyptian export price.

$$\mathbf{Ln\ Q_{USA} = -168.7 - 0.19\ Ln\ P_{eg} + 5.67\ I_{USA}}$$

(-0.23) (-3.39) (3.26)****

R^2 = 0.51 Adj.R^2 = 0.45 F = 8.80**

Where: Q_{USA}: Quantity of Egyptian dried onion exports to the US in tons.

Peg : Price of Egyptian dried onion exports to the US in dollars per ton.

I_{USA} : USA gross domestic product in millions of dollars.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

Also, a 10% increase in USA national income leads to a 56.7% increase in Egyptian dried onion exports to the Netherlands. This means that the derived income elasticity is greater than one, and therefore represents a more elastic demand that is significantly affected by income.

The model as a whole was found to be significant. The results also indicated that approximately 4% of the changes in the quantity of Egyptian dried onion exports to the Netherlands are due to the independent variables under study (Egyptian export price and USA national income, taking into account degrees of freedom).

4- Japan's external demand function for Egyptian dried onions:

The results of the statistical analysis of Japan's external demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to Japan leads to a 1.19% decrease in the quantity of Egyptian dried onions exported to Japan. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is greater than one. Therefore, it is an elastic demand, meaning that the quantity of exports is affected by the Egyptian export price.

$$\mathbf{Ln\ Q_{Jap} = -155.93 - 1.19\ Ln\ P_{eg} + 1.04\ Ln\ P_{India} + 5.60\ Ln\ I_{Jap}}$$

(-2.4)* (-2.56) (4.28)** (2.43)***

R^2 = 0.60 Adj.R^2 = 0.53 F = 8.04**

Where: Q_{Jap}: Quantity of Egyptian dried onion exports to Japan in tons.

P_{eg} : Egypt's dried onion export price to Japan (USD/ton).

P_{India}: India's dried onion export price to Japan (USD/ton).

I_{Jap}: Japan's gross domestic product (GDP) in millions of dollars.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

While a 10% increase in the export price of Indian dried onions to Japan leads to a 10.4% increase in the quantity of Egyptian dried onions exported to Japan. This means that the derived cross-elasticity of demand for Egyptian dried onion exports is close to one, and therefore represents an equally elastic demand that is not significantly affected by competitive prices.

Also, a 10% increase in Japanese national income leads to a 56.0% increase in the quantity of Egyptian dried onion exports to Japan. This means that the derived income elasticity is greater than one, and therefore represents a more elastic demand that is significantly affected by income.

The model as a whole was found to be significant. The results also indicated that approximately 53% of the changes in the quantity of Egyptian dried onion exports to Japan are due to the independent variables under study (Egyptian export price, Indian export price, and Japanese national income), taking into account degrees of freedom.

5- Belgium's external demand function for Egyptian dried onions:

The results of the statistical analysis of Belgium's external demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to Belgium leads to a 26.7% decrease in the quantity of Egyptian dried onions exported to Belgium. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is greater than one. Therefore, it represents an elastic demand, meaning that the quantity of exports is affected by the Egyptian export price.

$$\mathbf{Ln\ Q_{Bel} = 2.39 - 2.67\ Ln\ P_{eg} + 1.51\ Ln\ P_{Neth} + 1.63\ Ln\ P_{France}}$$

(0.72) (-6.52) (4.25)** (3.95)****

R^2 = 0.74 Adj.R^2 = 0.69 F = 15.33**

Where: Q_{Bel}: Quantity of Egyptian dried onion exports to Belgium in tons.

P_{eg} : Egyptian dried onion export price to Belgium in dollars per ton.

P_{Neth} : Northland dried onion export price to Poland in dollars per ton.

P_{Neth} : France dried onion export price to Poland in dollars per ton.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

While a 10% increase in the export price of dried onions from the Netherlands and France to Belgium leads to an increase in the quantity of Egyptian dried onion exports to Belgium by 15.1% and 16.3%, respectively. This means that the derived cross-elasticity of demand for Egyptian dried onion exports is greater than one, making it elastic and highly affected by competitive prices. The model as a whole was found to be significant. The results also indicated that approximately 69% of the changes in the quantity of Egyptian dried onion exports to Belgium are due to the independent variables under study (Egyptian export price, Dutch export price, and French export price), taking into account degrees of freedom.

6- Polish External Demand Function for Egyptian Dried Onions:

The results of the statistical analysis of the Polish external demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to Poland leads to a 26.7% decrease in the quantity of Egyptian dried onions exported to Poland. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is greater than one. Therefore, it is an elastic demand, meaning that the quantity of exports is affected by the Egyptian export price.

$$\mathbf{Ln\ Q_{Pol} = -69.68 - 2.67\ Ln\ P_{eg} + 2.62\ Ln\ P_{India} + 2.76\ Ln\ I_{Pol}}$$

(-2.42)* (-3.02) (3.53)** (2.40)***

R^2 = 0.51 Adj.R^2 = 0.42 F = 5.60**

Where: Q_{Pol}: Quantity of Egyptian dried onion exports to Poland in tons.

P_{eg} : Egyptian dried onion export price to Poland in dollars per ton.

P_{India} : Indian dried onion export price to Poland in dollars per ton.

I_{Pol} : Poland gross domestic product in millions of dollars.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

While a 10% increase in the price of Indian dried onions to Poland leads to a 26.2% increase in the quantity of Egyptian dried onions exports to Poland, this means that the derived cross-elasticity of demand for Egyptian dried onion exports is less than one, and therefore elastic demand is highly affected by competitive prices.

Also, a 10% increase in Polish national income leads to a 27.6% increase in the quantity of Egyptian dried onion exports to Poland. This means that the derived income elasticity is greater than one, and therefore elastic demand is highly affected by income.

The model as a whole was found to be significant, and the results indicated that approximately 42% of the changes in the quantity of Egyptian dried onion exports to Poland are due to the independent variables under study (Egyptian export price, Indian export price, and Polish national income), taking into account degrees of freedom.

7- The UK's external demand function for Egyptian dried onions:

The results of the statistical analysis of the UK's external demand function for Egyptian dried onions during the study period (2005-2024) show that a 10% increase in the export price of Egyptian dried onions to the UK leads to a 7.4% decrease in the quantity of Egyptian dried onions exported to the UK. This means that the price elasticity of demand for Egyptian dried onions, although negatively sloped and logical from an economic perspective, is less than one. Therefore, it represents inelastic demand, meaning that the quantity of exports is not affected by the Egyptian export price.

$$\mathbf{Ln\ Q_{U.K} = 0.956 - 2.23\ Ln\ P_{eg} + 0.74\ Ln\ P_{India} + 1.68\ Ln\ P_{USA} + 0.52\ Ln\ P_{Spain}}$$

(0.20) (-5.14) (2.18)* (2.64)** (2.01)***

R^2 = 0.68 Adj.R^2 = 0.60 F = 8.05**

Where: $Q_{U.K}$: Quantity of Egyptian dried onion exports to the United Kingdom in tons.

P_{eg}: Egypt's dried onion export price to the United Kingdom is $/ton.

P_{India}: India's dried onion export price to the United Kingdom is $/ton.

P_{USA}: US dried onion export price to the United Kingdom is $/ton.

P_{Spain}: Spain's dried onion export price to the United Kingdom is $/ton.

Source: Results of statistical analysis using SPSS for the data in www.trade map.com& world Bank.

While a 10% increase in the export price of dried onions from India and Spain to the UK leads to an increase in the quantity of Egyptian dried onion exports to the UK by 7.4% and 5.2%, respectively. This means that the derived cross-price elasticity of demand for Egyptian dried onion exports is less than one, and therefore inelastic demand is not significantly affected by competitive prices.

Meanwhile, a 10% increase in the export price of US dried onions to the UK leads to a 16.8% increase in the quantity of Egyptian dried onion exports to the UK. This means that the derived cross-price elasticity of demand for Egyptian dried onion exports is greater than one, and therefore elastic demand is significantly affected by competitive prices.

The model as a whole was found to be significant. The results also indicated that approximately 60% of the

changes in the quantity of Egyptian dried onion exports to the UK are due to the independent variables under study (Egyptian export price, Indian export price, US export price, and Spanish export price), taking into account degrees of freedom.

RECOMMENDATIONS

Through the results of the statistical analysis of the research data, several recommendations were reached to promote Egyptian dried onion exports, summarized as follows:

1. The price elasticity of demand for Egyptian dried onions in the American and Polish markets is lower than one (inelastic demand), meaning that Egyptian dried onions are of great importance to these countries. These countries' attempts to reduce their exports from Egypt by increasing export prices are weak, giving Egypt a significant opportunity to increase its export share of dried onions to these countries.

2. The price elasticity of demand for fresh Egyptian onions in the markets of Germany, Japan, Belgium, Poland, and the United Kingdom is higher than one (elastic demand), meaning that these countries have the ability to reduce their exports of Egyptian dried onions from Egypt and import from countries competing with Egypt when the price of Egyptian exports increases. This requires attention to these countries, and efforts to increase Egypt's market share by adopting appropriate and encouraging pricing and marketing policies.

3- The population regression coefficient demonstrates the compatibility of Egyptian dried onions with foreign consumer tastes, which encourages Egypt to explore new markets for fresh and dried onions and to prioritize and maintain the quality of fresh and dried Egyptian onions.

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الملخص العربي

تحليل قياسي للطلب الخارجي علي البصل المجفف المصري

محمد عبد النبى عبد السميع عبد الرحمن الحريرى، صلاح محمود مقلد سعيد، يسري أحمد عبد الدايم،

إيمان عبد الغفور أحمد

اتضح من التوزيع الجغرافى لكمية صادرات البصل المجفف المصري خلال فترة الدراسة (٢٠٢٤-٢٠٢٢). حيث يتضح أن اهم الدول المستوردة للبصل المجفف المصرية حوالي ٢٠ دولة من دول العالم حيث تستورد نحو ٩٢.٤٪ من متوسط إجمالي صادرات مصر منها خلال نفس الفترة. حيث تاتى ألمانيا فى المركز الأول من حيث الكمية المصدرة من البصل المجفف المصرية بمتوسط بلغ حوالى ٣٤٧٩٦٧ طن يمثل حوالى ١٨.٢٣٪ من متوسط الصادرات المصرية منها خلال نفس الفترة والبالغ حوالى ١٩٠٨٦.٦٧ طن. في حين تأتى هولندا فى المركز الثانى حيث بلغ متوسط صادرات مصر إليها حوالى ٣٣٨٩.٣٣ طن يمثل نحو ١٧.٧٦٪ من متوسط إجمالي صادرات البصل المجفف المصرية خلال فترة الدراسة. كما يتبين أن الولايات المتحدة الامريكية تاتى فى المركز الثالث من حيث وارداتها من الصادرات المصرية للبصل المجفف حيث بلغ متوسطها حوالى ٢١٣٨.٣٣ طن يمثل نحو ١١.٢٠٪ من متوسط إجمالي صادرات البصل المجفف المصرية خلال فترة الدراسة.

ولتقدير الطلب الخارجي على البصل المجفف المصري للسوق المستورد QEX تم صياغة نموذج إحصائي يحتوي على أهم المحددات وهي (سعر تصدير مصر للدولة المستوردة، سعر صادرات الدول المنافسة، عدد سكان الدولة المستوردة، متوسط الدخل الفردي للدولة المستوردة). ومن خلال استخدام طريقة الانحدار المتدرج ومصفوفة الارتباط بين المتغيرات المستقلة محل الدراسة للتخلص من مشكلة الازدواج الخطي حيث تم اجراء العديد من المحاولات لتحديد أهم النماذج الاحصائية المحددة لكمية صادرات البصل المجفف المصري لأهم الدول المستوردة (ألمانيا، هولندا، أمريكا، اليابان، بلجيكا، بولندا، المملكة المتحدة).

الكلمات المفتاحية: البصل المجفف، الطلب الخارجي، الأهمية النسبية.

APPENDICES

Table 1. Factors affecting Germany's external demand for Egyptian dried onions during the period (2005-2024)

(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	India's Price	France's Price	China's Price	Nerth's Price	Price	Income	Population
2005	6301	1567	1377	2504	2110	1843	4048	4276116	82.47
2006	5044	1628	1341	2417	2369	1720	4513	4453157	82.38
2007	6500	2111	721	2824	2782	2711	5869	4574589	82.27
2008	5607	2868	2149	3533	2890	1732	6901	4564369	82.11
2009	4990	2879	2204	3482	3029	3410	6194	4420546	81.90
2010	4127	2404	3026	3133	3371	1269	5723	4563989	81.78
2011	9017	1635	539	3288	3607	814	5694	4718859	80.27
2012	5691	2536	1654	3029	3141	2577	4548	4733082	80.43
2013	3908	3033	2157	3304	2988	2181	4446	4758571	80.65
2014	4923	3118	1980	3490	3035	2500	4570	4867492	80.98
2015	4688	3251	2170	3008	2980	2929	3728	4986274	81.69
2016	3092	2616	1671	3019	2745	2652	3307	5171480	82.35
2017	1857	3275	1431	3043	3171	2559	3592	5278129	82.66
2018	1843	3196	1349	3176	2817	2555	3324	5391118	82.91
2019	2706	2979	1673	3039	2975	2487	3181	5442937	83.09
2020	3719	2633	1967	2779	2890	2876	3568	5191019	83.16
2021	4881	2962	1895	2984	3399	4676	3030	5378190	83.20
2022	4538	2769	1976	2729	2735	3056	2910	5392257	83.80
2023	2989	3036	1979	3812	3104	2792	3537	5448332	83.90
2024	4787	3398	2076	3768	3292	2503	3777	5462317	83.51
Mean	91208	53894	35335	62361	59430	49842	86460	99072822	1645.5

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 2. Factors affecting Northland's external demand for Egyptian dried onions during the period (2005-2024)

(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	Belgium's Price	India's Price	France's Price	Germany's Price	China's Price	Income	Population
2005	2408	1492	2392	1190	2607	3143	6857	957525.6	16.32
2006	2238	1235	2414	1255	2668	2790	1600	998967.7	16.35
2007	1785	2220	3267	2089	3160	3758	2205	1028903	16.38
2008	1579	2868	3481	2116	4019	4578	2317	1012496	16.45
2009	1249	2878	3070	2524	3587	4122	2407	989391.7	16.53
2010	1484	2481	3011	3027	3500	3639	2744	1023860	16.62
2011	2446	1676	3376	2035	3397	3785	2185	1036386	16.69
2012	1335	2536	2984	1633	3148	3896	2313	1020581	16.75
2013	902	3170	3234	2154	3337	3863	2093	1023115	16.80
2014	1669	2628	3615	1840	3663	4170	2676	1033578	16.87
2015	2316	2816	3112	2082	3083	4100	2433	1057779	16.94
2016	3471	2616	3346	1630	3188	4102	3313	1068567	17.03
2017	4841	3275	1911	1464	3136	4251	4190	1109851	17.13
2018	4144	3195	3116	1372	3048	4087	3897	1148850	17.23
2019	3365	2980	2289	1568	2668	3879	2148	1160670	17.34
2020	4122	2632	2492	1981	2801	4405	2564	1105524	17.44
2021	3381	2962	2764	1812	3106	4463	2563	1216903	17.53
2022	3563	2769	2855	1924	3156	4077	2590	1230880	17.70
2023	3538	3036	3294	2003	4033	4509	2568	1258120	17.88
2024	3507	3398	3042	2143	4175	5109	2455	1276518	17.99
Mean	2667.2	2643.2	2953.3	1892.1	3274.0	4036.3	2805.9	1087923.4	17.0

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 3. Factors affecting USA's external demand for Egyptian dried onions during the period (2005-2024)

(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	China's Price	India's Price	Mexico's Price	Canda's Price	Germany's Price	Income	Population
2005	311	1497	1146	1459	686	1077	4214	17697672	295.52
2006	368	1645	1452	1342	652	566	6333	18147350	298.38
2007	253	3063	1748	2749	535	1714	8857	18570375	301.23
2008	665	2865	2125	1507	3101	2676	8956	18649992	304.09
2009	750	2880	2232	1796	2908	1473	5931	18180954	306.77
2010	777	2426	2591	3027	3075	1274	4842	18731263	309.38
2011	733	1677	2722	1838	3402	1649	5539	19053053	311.84
2012	164	2537	2626	1636	3531	1731	5073	19471494	314.34
2013	196	2412	2607	2035	3521	1553	5173	19871085	316.73
2014	258	1955	2716	1955	3562	1714	5365	20367039	319.26
2015	486	1895	2775	2100	3661	1628	5216	20941184	321.82
2016	288	2612	3118	1907	3699	1707	5796	21328365	324.35
2017	915	3274	3110	1586	2894	1380	5630	21914222	326.61
2018	624	3194	3050	1604	2737	2966	5756	22559232	328.53
2019	588	3000	2857	1796	2148	3767	5133	23120732	330.23
2020	2123	2637	3123	1966	2631	5779	5517	22549782	331.58
2021	4485	2961	3232	1938	2429	3404	5690	23833823	332.10
2022	1887	2769	3069	2122	2684	5306	4916	24415440	334.02
2023	2770	3036	3195	2162	3075	5842	9250	25067669	336.81
2024	3653	3398	3340	2281	2426	4718	14837	25727228	340.11
Mean	1114.7	2586.65	2641.7	1940.3	2667.833	2596.2	6401.2	21009898	319.1839

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 4. Factors affecting Japan's external demand for Egyptian dried onions during the period (2005-2024)
(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	USA's Price	China's Price	India's Price	France's Price	Spain's Price	Income	Population
2005	749	1880	2274	1982	958	3400	2851	5.6	127.7
2006	684	2141	2977	2282	1025	2918	3246	5602600.5	127.9
2007	331	2103	3004	4725	1034	3800	3367	5676153.3	128.0
2008	652	2865	2751	4319	2286	4747	4583	5496168.3	128.1
2009	503	2879	2658	4827	2059	4197	4157	5256612.4	128.0
2010	1628	2298	2718	4719	3033	4244	3283	5437816.2	128.1
2011	2212	1666	2767	4078	2788	4336	3015	5387595.0	127.8
2012	1272	2537	2603	3990	1314	3341	3103	5443345.5	127.6
2013	700	3966	2480	4580	2490	3806	3225	5566392.7	127.4
2014	970	3001	2389	4224	3091	3607	3691	5587657.3	127.3
2015	916	3154	2392	4340	2022	3133	3245	5773578.6	127.1
2016	1091	2616	2444	4794	2048	3239	3479	5842241.4	127.1
2017	1473	3274	2429	4706	2278	3374	3412	5917810.7	127.0
2018	1234	3195	2756	4588	2214	3908	3506	5918089.7	126.8
2019	1243	2981	2757	4524	2442	3356	3273	5907817.0	126.6
2020	1515	2633	2726	4473	2463	3436	3345	5698731.9	126.3
2021	1613	2962	2748	4343	2670	3654	3486	5840708.3	125.7
2022	1568	2768	2887	4985	2451	3577	3275	5820213.9	125.1
2023	1311	3036	2873	5129	2811	4431	3781	5964659.6	124.5
2024	2199	3398	2955	4828	2876	4412	4784	5999145.2	124.0
Mean	1193.2	2767.65	2679.4	4321.8	2217.65	3745.8	3505.317	5406867.2	126.9

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 5. Factors affecting Belgium's external demand for Egyptian dried onions during the period (2005-2024)
(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	India's Price	North's Price	China's Price	Spain's Price	France's Price	Income	Population
2005	1393	1623	1309	2789	1633	1929	2098	588740.3	10.5
2006	1262	1549	1443	2610	1575	1395	2364	601736.9	10.5
2007	1508	2165	1402	3553	1875	3026	2728	624381.7	10.6
2008	1130	2868	1764	4174	2378	1378	4640	620577.2	10.7
2009	1556	2880	2021	3416	2348	2025	4009	618404.8	10.8
2010	1404	2295	3025	3302	2672	3000	3311	624509.8	10.9
2011	1477	1668	2017	2025	3835	2685	3505	621071.8	11.0
2012	768	2535	1772	2281	2698	2540	3893	635273.1	11.1
2013	972	2342	2078	1930	2682	3020	4133	639251.1	11.2
2014	1026	2247	2215	2677	3888	2514	3345	649103.3	11.2
2015	370	2589	2106	2984	3639	2481	2943	660427.6	11.3
2016	565	2613	1818	2691	3727	2751	2643	669610.0	11.3
2017	433	3272	1543	2796	2286	2283	3063	677273.3	11.4
2018	325	3188	1487	2748	10500	1989	3320	686393.0	11.4
2019	315	2974	1610	2722	2202	1433	3218	706134.1	11.5
2020	1097	2634	1971	3856	4152	823	3424	674792.2	11.5
2021	1274	2962	2062	4047	2303	2009	3630	711954.6	11.6
2022	1464	2769	2049	3414	2556	1236	3647	717242.8	11.7
2023	925	3036	2097	3622	2250	2737	4244	734976.0	11.8
2024	918	3397	2206	3597	2353	3724	4414	744412.5	11.9
Mean	1009.1	2580.3	1899.75	3061.7	3077.6	2248.9	3428.6	660313.3	11.2

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 6. Factors affecting Poland's external demand for Egyptian dried onions during the period (2005-2024)

(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	India's Price	France's Price	Spain's Price	USA's Price	North's Price	Income	Population
2005	268	1186	1215	2449	2296	2728	2360	786671.4	38.17
2006	214	1502	1129	2454	2875	2783	1925	828907.1	38.14
2007	588	2462	2402	3260	3367	2839	2891	883755.8	38.12
2008	201	2866	1856	3572	4250	2894	3574	931804.4	38.13
2009	280	2879		3498	3919	2950	3411	955102.3	38.15
2010	384	1831	3025	2899	3371	3005	2414	976950.1	38.04
2011	120	1659	1167	3028	2908	3061	4308	1018006	38.06
2012	99	2538	1588	2881	2753	3116	3180	1024726	38.06
2013	53	3149	2051	3174	3351	3172	3250	1037727	38.04
2014	201	2892	1807	3409	3455	3227	3283	1084894	38.01
2015	514	2710	2152	2882	3888	3283	2455	1147570	37.99
2016	253	2611	1480	2978	4239	3338	2605	1183294	37.97
2017	23	3500	1334	3014	4590	3394	2700	1241031	37.97
2018	29	3294	1237	3136	739	3449	2990	1312936	37.97
2019	131	2984	1628	2868	682	3505	2407	1383045	37.97
2020	189	2630	1895	2934	2439	3560	4860	1378824	37.52
2021	396	2963	1802	3241	2653	3798	15333	1451722	36.98
2022	1078	2767	1804	3620	671	3556	3717	1506263	36.82
2023	630	3038	1776	4674	3261	3409	3079	1529771	36.69
2024	610	3396	1948	4281	3896	4032	4621	1573452	36.55
Mean	313.1	2642.9	1752.4	3212.6	2980.2	3254.8	3768.2	1161823	37.77

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.

Table 7. Factors affecting United Kingdom's external demand for Egyptian dried onions during the period (2005-2024)

(Quantity: tons, price: $/ton, income: $1 million, population: million)

Years	Quantity Export	Egypt's Price	India's Price	China's Price	USA's Price	Spain's Price	France's Price	Income	Population
2005	986	1402	1329	1333	2274	1670	2387	2846251	60.40
2006	1473	1021	1263	1669	2310	2622	2498	2869691	60.85
2007	1151	1937	2078	2333	2422	3531	2903	2927305	61.32
2008	780	2869	2034	2006	2574	5024	3601	2887738	61.81
2009	564	2882	1805	2006	2885	2544	3650	2793168	62.28
2010	1043	2078	3026	2067	2452	1592	3269	2892525	62.77
2011	1233	1666	2014	2084	2165	1557	3163	2926295	63.26
2012	662	2537	1783	2381	2263	2680	2958	2940375	63.71
2013	463	2880	1695	2282	2419	3005	3155	2981635	64.14
2014	940	2168	2199	3079	2720	2752	3216	3097670	64.62
2015	864	2435	6231	2989	2618	2551	2775	3179133	65.09
2016	414	2615	2011	3353	2478	2680	2758	3233982	65.61
2017	151	3281	1709	2750	2487	2942	2793	3348140	65.97
2018	102	3200	1526	2038	2849	1102	2935	3385017	66.29
2019	166	2972	1693	2086	2961	1354	2773	3491625	66.63
2020	876	2632	1919	1967	3043	939	2985	3081311	66.74
2021	904	2963	1914	2622	3336	2837	3277	3436888	66.98
2022	1073	2769	1994	2521	3707	2896	3291	3552217	67.60
2023	1059	3035	1902	2460	4370	3500	4205	3543515	68.49
2024	744	3397	1985	2380	4524	3928	4067	3617500	69.23
Mean	782.4	2536.95	2105.5	2320.3	2842.85	2585.3	3132.95	3151599	64.69

Source: Compiled from:
Official website www.trademap.org.
Data from the official website of the World Bank.