An Analytical Study of the Competitive Position of Frozen Egyptian Strawberry in the important Import Markets Using the Gravity Model

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ABSTRACT

The development of exports, particularly agricultural exports, is one of the primary strategies for increasing foreign currency, addressing the balance of payments deficit, and improving the Egyptian agricultural trade balance. Egyptian frozen strawberries are among the agricultural products that can contribute to increasing Egyptian exports, as they have recently experienced growing demand and significant global growth due to their quality and availability for extended periods throughout the year. This highlights the product's ability to compete in international markets. The research problem lies in the fact that, despite the noticeable growth in Egyptian frozen strawberry exports in recent years, they face multiple challenges in importing markets. These challenges include an increasing number of competitors, the development of competing countries' capabilities, and improvements in the quality of their products as well as marketing and distribution efficiency. This research aimed to analyze the competitive position of Egyptian frozen strawberries in the most significant importing markets. The findings, derived from the Revealed Comparative Advantage (RCA) index, indicate that frozen strawberry crops are significant products that compete fiercely in global markets. Additionally, the results of the market share index in key importing markets showed an increase during the period from 2018 to 2022, with market shares representing substantial percentages, particularly in the Saudi and Russian markets. The price competitiveness index for Egyptian frozen strawberries reveals that the export prices of these strawberries have a competitive price advantage compared to competing countries in the most important importing markets. The market penetration index indicates an increase in the penetration rates of Egyptian frozen strawberry exports in key importing markets, illustrating an increased capacity of these markets to absorb Egyptian frozen strawberries. Furthermore, the results of the gravity model analysis for the main importing countries of Egyptian frozen strawberries during the period from 2017 to 2022 indicate a direct relationship between the gross domestic product (GDP) of the importing countries, Egypt's GDP, the average per capita GDP of Egyptians, and the import prices of frozen strawberries from Egypt, as well as the quantity of Egyptian frozen strawberry exports. Conversely, there is an inverse relationship between distance and export volume, meaning that as distance increases, the quantity of exports decreases, and vice versa. This aligns with economic logic. It was also shown that price has the most significant impact on frozen strawberry exports across various models, followed by Egypt's GDP, then distance, and finally the GDP of the importing countries.

Keywords: Frozen strawberry, Competitiveness, Gravity model, Panel data, Egypt.

INTRODUCTION

Foreign trade is considered as one of the main pillars of the Egyptian national economy, which is considered when formulating economic development plans. Foreign trade is an indicator that shows the country's ability to open export horizons to countries around the world. Without successful exports, the horizons of development recede, employment opportunities decrease, and national income decreases.

Frozen strawberries are considered as one of the important Egyptian agricultural export products, as they have a growing global demand due to their nutritional benefits and distinctive storage characteristics. In recent years, Egyptian frozen strawberry exports have witnessed remarkable growth, confirming the ability of this product to compete in international markets.

RESEARCH PROBLEM

Despite the significant growth witnessed by Egyptian frozen strawberry exports in the recent years, they face multiple challenges in the importing markets, as the number of competitors in these markets has increased, in addition to the improved capabilities of competing countries and the enhancement of the quality of their products, as well as the efficiency of marketing and distribution. Given the importance of Egyptian frozen strawberry exports and their role in achieving economic returns for the country, identifying the competitive position of this product in the important importing markets, and analyzing the factors affecting it

DOI: 10.21608/esm.2024.384575
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Received August 15, 2024, Accepted, September 12, 2024.

is necessary to develop effective strategies to enhance its competitiveness and increase its share in these markets.

RESEARCH OBJECTIVES

To achieve its objectives, the research relies on some methods of descriptive statistical analysis, such as averages and percentages, as well as quantitative analysis methods, where some analysis techniques were used, such as estimating general time trend equations, indicators of relative and competitive ability, and the gravity model, using (Excel - SPSS - EViews) programs.

The research primarily relies on published and unpublished secondary data issued by specialized agencies such as the Food and Agriculture Organization of the United Nations (FAO), as well as some data published on the international information network (the Internet) such as www.trademap.org.

Firstly: - Determining the competitive position of Egyptian frozen strawberries in the important import markets.

(a) Global exports of frozen strawberries: -

Egypt, Mexico, Poland, Chile, Morocco, China, the Netherlands, and Belgium are considered among the important countries exporting frozen strawberries in the world, where their market share is around 76.26% of the average quantity of frozen strawberry exports worldwide during the period from (2018-2022). Table (1) shows that Egypt ranks first among the important exporting countries of frozen strawberries in terms of the value and quantity of exports, with an average of about dollar187.51 million.

representing about 15.3% of the average value of frozen strawberry exports worldwide, estimated at about dollar1.22 billion, and an average of about 93.32 thousand tons, representing about 14.25% of the average quantity of frozen strawberry exports around the world during the study period. Mexico and Poland come next in the second and third positions, respectively, in terms of the value and quantity of exports, with an average of about (dollar168.01, dollar163.51) million, respectively, representing about 13.71%, 13.34% of the average value of frozen strawberry exports for the study period, and an average of about (88.95, 87.24) thousand tons, respectively, representing 13.58%, 13.32% of the average quantity of frozen strawberry exports worldwide during the study period. Regarding the value of frozen strawberry exports, Chile and Morocco come in the fourth and fifth positions, with an average of dollar108.67 million and dollar98.85 million, respectively, with a relative importance of 8.87% and 8.06%. The table shows the average value and relative importance of the remaining exporting countries of frozen strawberries during the study period.

Table 1. The important countries exporting frozen strawberries globally during the period (2018–2022)

Country	Average Value (Million dollars)	Relative importance (%)	Average Quantity (Thousand Ton)	Relative importance (%)	Average Price (dollar/Ton)
Egypt	187.51	15.3	93.33	14.25	2007.7
Mexico	168.01	13.71	88.95	13.58	1885.4
Poland	163.51	13.34	87.24	13.32	1869
Chile	108.67	8.87	48.7	7.44	2228.2
Morocco	98.85	8.06	71.59	10.93	1383.6
China	83.37	6.8	51.32	7.83	1632.2
Netherlands	62.92	5.13	36.19	5.53	1746.2
Belgium	43.82	3.58	22.18	3.39	1972.4
Peru	38.75	3.16	18.38	2.81	1881.8
Türkiye	42.63	3.48	20.51	3.13	2075.2
Spain	53.43	4.36	35.87	5.48	1492.6
America	49.5	4.04	19.14	2.92	2622.8
Germany	23.9	1.95	14.07	2.15	1727.6
Serbia	14.47	1.18	6.22	0.95	2320
France	16.28	1.33	7.11	1.09	2312.2
Rest of the world	70.11	5.72	34.18	5.22	2762.6
Total world	1225.71	100	654.97	100	1995.04

Source: www.trademap.org

Table 2. The geographical distribution of the value and quantity of Egypt's exports of frozen strawberries during the period (2018–2022)

Country	Average Value (Million dollars)	Relative importance (%)	Average Quantity (Thousand Ton)	Relative importance (%)	Average Price (dollar/Ton)
Germany	30.47	16.25	15.17	16.25	2008.6
Russian Federation	20.24	10.8	10.1	10.82	2008.6
China	18.74	9.99	9.24	9.9	2008.8
Netherlands	18.28	9.75	9.17	9.83	2008.6
Poland	14.41	7.69	7.18	7.69	2008.8
Saudi Arabia	10.33	5.51	5.2	5.58	2008.6
Japan	9.93	5.29	5.02	5.38	2008.8
USA	8.32	4.44	4.1	4.39	2008.8
Belgium	7.01	3.74	3.49	3.74	2008.8
Italy	6.65	3.55	3.33	3.57	2008.8
France	4.95	2.64	2.47	2.64	2008.8
United Kingdom	3.36	1.79	1.65	1.77	2007.2
Rest of the world	34.81	18.57	17.21	18.44	1996.4
Total world	187.51	100	93.33	100	2007.7

Source: www.trademap.org

Regarding export prices, the same table data indicates a noticeable variation in the export prices of frozen strawberries within the export markets, ranging from around dollar1,383.6 per ton as a minimum for Moroccan exports, equivalent to about 69.3% of the global average price, and up to around dollar2,622.8 per ton as a maximum for exports from the United States, equivalent to about 131.4% of the global average price. As for Egypt, the average price is dollar2,007.7 per ton, which represents about 100.6% of the global average price, and the variation in prices between exporting countries is attributed to the existence of non-price advantages.

(b): The Geographical Distribution and Relative Importance of Egyptian Exports of Frozen Strawberries

The table (2) illustrates the geographical distribution of the quantity and value of Egypt's exports of frozen strawberries to the important global markets, as an average for the period (2018-2022).

The data in the table indicates that the average value of frozen strawberry exports is approximately dollar187.51 million, and the average quantity is around 93.33 thousand tons, with an average export price of approximately dollar2,007.7 per ton. Germany is the important and largest market for Egyptian frozen strawberries, importing an average of approximately dollar30.47 million, which represents about 16.25% of the average value of Egyptian exports of frozen strawberries, and an average of approximately 15.17 thousand tons, which represents about 16.25% of the average quantity of Egyptian exports of frozen strawberries during the study period.

The markets of the Russian Federation, China, the Netherlands, and Poland occupy the second, third, fourth, and fifth positions, with an average of approximately (dollar20.24 million, dollar18.74 million, dollar18.28 million, dollar14.41 million) respectively, representing about 10.8%, 9.99%, 9.75%, and 7.69% of the average value of Egyptian exports of frozen strawberries, and an average of approximately (10.1 thousand tons, 9.24 thousand tons, 9.17 thousand tons, 7.18 thousand tons) respectively, representing about 10.82%, 9.92%, 9.83%, and 7.69% of the average quantity of Egyptian exports of frozen strawberries during the period (2018-2022). Meanwhile, Saudi Arabia, Japan, the United States, and Bangladesh occupied the sixth, seventh, and eighth positions, with an average of approximately (dollar10.33 million, dollar9.93 million, dollar8.23 million) respectively, representing about 5.51%, 5.29%, and 4.44% of the average value of Egyptian exports of frozen strawberries, and an average of approximately (5.2 thousand tons, 5.02 thousand tons, 4.1 thousand tons)

respectively, representing 5.58%, 5.38%, and 4.39% of the average quantity of Egyptian exports of frozen strawberries during the study period.

Regarding the export price of Egyptian frozen strawberries in the important import markets, it ranged between approximately dollar2,007.2 per ton, the minimum, for the United Kingdom, which is equivalent to about 99.9% of the average Egyptian export price, and approximately dollar2,008.8 per ton, the maximum, for exports to most countries, which is equivalent to about 100.005% of the average Egyptian export price.

(C): Indicators for Measuring the Competitive Ability of Egypt's Exports of Frozen Strawberry in the important Import Markets

1- Revealed Comparative Advantage Index

The Revealed Comparative Advantage (RCA) reflects the extent to which a country possesses advantages that facilitate the production of specific goods, such as natural and climatic conditions, raw materials, or cheap labor. However, these advantages may not help the country compete in foreign markets, which could be due to lower quality, higher costs, or non-compliance with the standards required by foreign markets. The RCA is measured by the following equation:

$$RCAJ = \left(\frac{X_{ji}}{X_{ja}}\right) / \left(\frac{X_{wi}}{X_{wa}}\right)$$

Where

X_{ji} : Value of exports of country j for good i.

X_{ja} : Total value of agricultural exports of country j.

X_{wi} : Value of world exports of good i.

X_{wa} : Total value of world agricultural exports.

When the index value is greater than one, it indicates a competitive advantage for this crop's exports in that country. Table (3) illustrates the RCA index for frozen strawberries during the period from 2018 to 2022, showing that the index value exceeds one during this period, indicating a revealed comparative advantage for Egypt's frozen strawberry exports in foreign markets.

Moreover, the RCA index increased from 31.68 in 2018 to reach its highest level of around 57.22 in 2022, suggesting a growing competitive edge for this commodity in the global markets. The average RCA index during the 2018-2022 period was approximately 40.94, which signifies that this export commodity is among the important products that strongly compete in the global markets. This, however, requires maintaining the export markets for this commodity by meeting the required global market specifications and opening new markets to accommodate the growing production.

2- Market Share Index

Market share is calculated as follows:

$$\text{Market Share} = \frac{\text{Quantity of Egypt's exports to a country of a specific good}}{\text{Total quantity of imports of that country for the same good}} \times 100$$

The market share of exports in foreign markets reflects the ability of these exports to meet the market demands and the potential for export development in those markets. It is one of the vital indicators for formulating production and export policies, which impacts the achievement of strategic agricultural goals. The geographical distribution of the value and quantity of Egypt's frozen strawberry exports during the period from 2018 to 2022, as shown in Table (2), indicates that the German, Russian, Chinese, Dutch, Poland, and Saudi markets are among the most significant importing markets for Egyptian frozen strawberries. The market share index for Egyptian frozen strawberry exports and competing countries in these markets is estimated as shown in Table (4).

Table 3. Estimation of the revealed comparative advantage index for frozen strawberry exports during the period (2018–2022). (Value: Million dollar)

Year	Value of Egyptian frozen strawberry exports	Value of Egyptian agricultural exports	Value of global frozen strawberry exports	Value of global agricultural exports	RCA
2018	119.91	5013.68	1099.88	1456978	31.68
2019	152.46	5450.91	1133	1449044	35.77
2020	151.53	5182.85	1183.19	1494689	36.93
2021	236.56	6256.54	1372.96	1744477	48.04
2022	277.08	6881.86	1339.5	1903560	57.22
Average	187.51	5757.17	1225.71	1609749	40.94

Source: www.trademap.org,,, www.fao.org

Table 4. Index of the market share of the quantity of Egyptian frozen strawberry exports and the most competing countries during the period (2018–2022)

Year	German Market			Russian Market			Chinese Market		
	Egypt	Poland	Morocco	Egypt	China	Belarus	Egypt	Chile	Morocco
2018	26.98	34.62	8.96	51.79	40.36	2.81	21.21	14.78	32.85
2019	31.71	31.49	10.24	71.86	22.69	1.82	43.5	23.75	23.01
2020	33.32	30.45	11.02	81.8	12.23	3.9	39.63	35.48	23.41
2021	44.02	23.81	10.11	90.18	7.17	1.29	70.37	16.41	12.24
2022	49.33	20.51	9.36	93.16	5.14	0.75	80.37	15.18	3.58
Year	**Dutch Market**			**Polish Market**			**Saudi Market**		
	Egypt	**Morocco**	**Poland**	**Egypt**	**Ukraine**	**Germany**	**Egypt**	**Chile**	**China**
2018	22.31	14.92	22.59	27.29	11.55	20.28	73.81	4.51	18.42
2019	27.65	15.19	22.99	44.88	10.2	14.37	82.16	5	7.03
2020	24.97	18.45	19.51	44.48	5.69	19.33	81.08	12.04	0
2021	28.32	22	18.16	63.1	9.12	6.1	87.32	7.01	0.07
2022	38.08	21.09	11.69	73.32	7.56	7.33	85.36	8.32	0

Source: www.trademap.org, www.fao.org

Table 5. The geographical distribution of the quantity of frozen strawberry imports in the German market during the period (2018-2022) (Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	29.74	33.501	34.235	42.431	49.626	37.91	36.76
Poland	38.166	33.27	31.289	22.951	20.634	29.26	28.37
Morocco	9.877	10.822	11.324	9.747	9.417	10.24	9.93
Netherlands	7.213	8.03	8.263	5.782	3.373	6.53	6.33
Spain	9.574	7.346	5.485	4.477	5.085	6.39	6.2
Türkiye	4.219	3.221	3.621	4.381	3.541	3.8	3.68
Belgium	2.516	2.295	2.082	1.679	3.268	2.37	2.3
China	3.599	1.85	2.096	1.507	0.218	1.85	1.8
Serbia	1.443	1.904	1.044	0.724	2.129	1.45	1.4
Rest of countries	3.899	3.408	3.305	2.72	3.314	3.33	3.23
Total	110.246	105.647	102.744	96.399	100.605	103.13	100

Source: www.trademap.org

Table 6. The geographical distribution of the quantity of frozen strawberry imports in the Russian market during the period (2018-2022) (Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	11.793	19.878	21.338	24.114	31.51	21.73	79.21
China	9.191	6.277	3.189	1.917	1.74	4.46	16.27
Belarus	0.639	0.503	1.017	0.346	0.255	0.55	2.01
Serbia	0.638	0.41	0.223	0.343	0.287	0.38	1.39
Rest of countries	0.511	0.593	0.317	0.021	0.03	0.31	1.13
Total	22.772	27.661	26.084	26.741	33.822	27.43	100

Source: www.trademap.org

This is considered as an important indicator in formulating production and export policies, which is reflected in achieving the strategic agricultural objectives. The geographical distribution of the value and quantity of Egyptian frozen strawberry exports during 2018-2022 (Table 2) shows that the German, Russian, Chinese, Dutch, Polish, and Saudi markets are the main import markets for Egyptian frozen strawberries. Accordingly, the market share index for

Egyptian frozen strawberry exports in these markets was estimated, as shown in Table 4.

A- The German Market

The geographic distribution of frozen strawberry imports in the German market during the study period, as shown in Table (5), indicates that Poland and Morocco are Egypt's main competitors in this market.

Table (4) reveals that Egypt's market share of Germany's total imports increased from approximately 26.98% in 2018 to about 49.33% in 2022. Furthermore, the market share of Egyptian frozen strawberries is increasing at the expense of competitors' market shares within the German market, which necessitates maintaining this competitive position and working to enhance it, especially against competing countries.

B- The Russian Market

The geographic distribution of frozen strawberry imports in the Russian market during the study period, as shown in Table (6), indicates that China and Belarus are Egypt's main competitors in this market. Table (4) shows that Egypt's market share of Russia's total imports rose from approximately 51.79% in 2018 to about 93.16% in 2022. The market share of Egyptian frozen strawberries is increasing at the expense of competitors' market shares within the Russian market, which requires maintaining this competitive position and working to enhance it, considering the competitive situation with the closest competitor, China, along with monitoring any changes in competition with other countries.

C- The Chinese Market

The geographic distribution of frozen strawberry imports in the Chinese market during the study period, as shown in Table (7), indicates that Chile and Morocco are Egypt's main competitors in this market. It is evident from Table (4) that Egypt's market share of China's total imports increased from approximately 21.21% in 2018 to about 80.37% in 2022. The market share of Egyptian frozen strawberries is increasing at the expense of competitors' market shares within the Chinese market, which necessitates maintaining this competitive position and working to enhance it, especially regarding competing countries.

D- The Dutch Market

The geographic distribution of frozen strawberry imports in the Dutch market during the study period, as shown in Table (8), indicates that Morocco and Poland are Egypt's main competitors in this market. Table (4) reveals that Egypt's market share of the Netherlands' total imports fluctuated during the study period, reaching a minimum of approximately 22.31% in 2018 and a maximum of about 38.08% in 2022. The market share of Egyptian frozen strawberries is increasing at the expense of competitors' market shares within the Dutch market, which requires maintaining this competitive position and working to enhance it, particularly against competing countries.

E- The Polish Market

The geographic distribution of frozen strawberry imports in the Polish market during the study period, as shown in Table (9), indicates that Ukraine and Germany are Egypt's main competitors in this market. Table (4) shows that Egypt's market share of Poland's total imports increased from approximately 27.29% in 2018 to about 73.32% in 2022. Additionally, it is evident that the market share of Egyptian frozen strawberries is growing at the expense of competitors' market shares within the Polish market, which necessitates maintaining this competitive position and working to enhance it against competing countries.

Table 7. The geographical distribution of the quantity of frozen strawberry imports in the Chinese market during the period (2018-2022) (Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	3.044	7.993	8.269	25.718	31.135	15.23	57.14
Chile	2.122	4.365	7.403	5.996	5.879	5.15	19.33
Morocco	4.715	4.228	4.885	4.474	1.388	3.94	14.77
Peru	2.028	0.152	0	0	0	1.09	4.09
America	1.712	1.294	0.005	0.011	0.002	0.6	2.27
France	0.578	0.336	0.263	0.342	0	0.38	1.42
Rest of countries	0.153	0.006	0.04	0.004	0.336	0.26	0.98
Total	14.352	18.374	20.865	36.545	38.74	26.66	100

Source: www.trademap.org

Table 8. presents the geographical distribution of the quantity of frozen strawberry imports in the Dutch market during the period (2018-2022). (Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	11.659	14.417	12.18	13.66	18.45	14.07	27.98
Morocco	11.808	11.99	9.519	8.76	5.663	9.55	18.99
Poland	7.797	7.921	8.999	10.613	10.217	9.11	18.11
Belgium	9.207	6.581	6.101	3.589	5.151	6.13	12.18
Spain	3.796	3.577	4.502	3.156	2.433	3.49	6.95
Germany	0.894	1.552	1.839	3.129	2.387	1.96	3.9
Sweden	0.736	1.422	1.484	2.629	1.865	1.63	3.24
Serbia	1.774	0.812	0.891	0.704	0.046	0.85	1.68
Türkiye	1.503	1.01	0.997	0.093	0.051	0.73	1.45
France	0.875	1.582	0.27	0.272	0.272	0.65	1.3
Rest of countries	2.217	1.286	1.997	1.63	1.914	2.12	4.22
Total	52.266	52.15	48.779	48.235	48.449	50.29	100

Source: www.trademap.org

Table 9. presents the geographical distribution of the quantity of frozen strawberry imports in the Polish market during the period (2018-2022).(Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	5.762	10.538	11.547	18.948	32.942	15.95	54.79
Germany	4.282	3.374	5.019	1.833	3.294	3.56	12.23
Ukraine	2.438	2.396	1.476	2.74	3.398	2.49	8.55
China	2.522	1.3	2.761	0.811	0.211	1.52	5.23
Morocco	0.62	1.09	1.062	0.684	1.084	0.91	3.12
Czech	1.343	0.941	1.225	0.556	0.416	0.9	3.08
Netherlands	1.766	0.748	0.198	0.243	0.178	0.63	2.15
Türkiye	0.457	0.255	0.55	0.766	0.471	0.5	1.72
Spain	0.476	0.202	0.572	0.624	0.58	0.49	1.69
Denmark	0.327	0.503	0.344	0.513	0.342	0.41	1.39
Belgium	0.537	0.339	0.145	0.555	0.41	0.4	1.36
France	0.197	0.182	0.228	0.833	0.5	0.39	1.33
Rest of countries	0.389	1.615	0.837	0.924	1.103	0.97	3.35
Total	21.116	23.483	25.964	30.03	44.929	29.1	100

Source: www.trademap.org

F- The Saudi Market

The geographic distribution of frozen strawberry imports in the Saudi market during the period from 2018 to 2022, as shown in Table (10), indicates that Chile and China are Egypt's main competitors in this market. Table (4) reveals that Egypt's market share of Saudi Arabia's total imports increased during the study period, with a minimum of approximately 73.81% in 2018 and a maximum of about 87.32% in 2021. The data illustrate a rise in the market share of Egyptian frozen strawberries in the Saudi market, necessitating the maintenance of these proportions.

The estimated market share in the important import markets has increased during the period from (2018-2022), and these shares represent large percentages, especially in the case of the Saudi and Russian markets, which requires maintaining these markets through continuous study of the needs of these markets in terms of quantity, quality, and the appropriate timing for each market.

Table 10 presents the geographical distribution of the quantity of frozen strawberry imports in the Saudi market during the period (2018-2022).(Quantity: Thousand tons)

Country	2018	2019	2020	2021	2022	average	Relative importance (%)
Egypt	7.351	9.646	7.709	7.746	9.651	42.1	81.94
Chile	0.449	0.587	1.145	0.622	0.941	3.74	7.29
China	1.835	0.825	0	0.006	0	2.67	5.19
Serbia	0.001	0.008	0.248	0.262	0.55	1.07	2.08
Türkiye	0.133	0.498	0.002	0	0	0.63	1.23
Rest of countries	0.189	0.176	0.405	0.235	0.163	1.17	2.27
Total	9.958	11.74	9.509	8.871	11.305	51.38	100

Source: www.trademap.org

3- Price Competitiveness Index

The ratio between the Egyptian export price for a particular commodity and the export prices of the important competing countries for Egypt in exporting that commodity is considered one of the factors affecting the competitive position of Egyptian exports of that commodity in foreign markets. The price competitiveness index is estimated by finding the price ratio from the export price of the competing country for the commodity and the Egyptian export prices for the same commodity.

$$PA_j = \frac{P_c}{P_e}$$

PAj: The weighted average of the prices of the important competing countries in the global market or (a specific market) for the product under study, divided by the export price of the product in Egypt.

Pc: The weighted average of the export prices of the product in the important competing countries.

Pe: The export price of the product in Egypt.

If the value of this index exceeds one, it indicates that Egypt's price has a competitive advantage in exporting this commodity, and if it is less than one, it indicates a high price competitive advantage for this product in the foreign market. Table (11) shows the price competitiveness index for Egyptian frozen strawberry exports compared to the important competing countries in the main import markets for Egyptian frozen strawberries.

Table 11. presents the price competitiveness index for Egyptian frozen strawberry exports compared to the important competing countries in the main import markets during the period (2018-2022)

Year	German Market		Russian Market		Chinese Market	
	Poland	Morocco	China	Belarus	Chile	Morocco
2018	1.658	1.413	1.098	1.008	1.39	1.034
2019	1.528	1.393	1.368	1.002	1.426	1.134
2020	1.431	1.396	1.904	1.049	1.233	1.097
2021	1.377	1.599	1.695	1.01	1.299	1.21
2022	1.453	1.541	1.315	1.165	1.195	1.074
Average	**1.486**	**1.466**	**1.448**	**1.045**	**1.306**	**1.108**
Year	**Dutch Market**		**Polish Market**		**Saudi Market**	
	Morocco	**Poland**	**Ukraine**	**Germany**	**Chile**	**China**
2018	1.274	1.388	1.338	1.497	2.761	1.519
2019	1.332	1.336	1.308	1.455	2.641	1.484
2020	1.245	1.271	1.247	1.424	2.584	1.364
2021	1.535	1.39	1.53	1.446	3.417	1.276
2022	1.521	1.308	1.719	1.079	3.943	1.625
Average	**1.376**	**1.338**	**1.418**	**1.371**	**3.026**	**1.448**

Source: www.trademap.org ,,,,,, www.fao.org

A- The German Market

The values of the price competitiveness index for Egyptian frozen strawberries compared to the prices of competing countries in the German market, shown in Table (11), indicate that the export price of Egyptian frozen strawberries is lower than the prices of the competing countries, which are Poland and Morocco, meaning that Egyptian frozen strawberries in the German market have a price advantage compared to the other competing countries.

B- The Russian Market

The values of the price competitiveness index for Egyptian frozen strawberries compared to the prices of competing countries in the Russian market, shown in Table (11), indicate that the export price of Egyptian frozen strawberries is lower than the prices of the competing countries, which are China and Belarus, meaning that Egyptian frozen strawberries in the Russian market have a price advantage compared to the other competing countries.

C- The Chinese Market

The values of the price competitiveness index for Egyptian frozen strawberries compared to the prices of competing countries in the Chinese market, as shown in Table (11), indicate that the export price of Egyptian frozen strawberries is lower than the prices of the competing countries in this market, which are Chile and Morocco. This means that Egyptian frozen strawberries in the Chinese market enjoy a price advantage compared to the other competing countries.

D- The Dutch Market

The values of the price competitiveness index for Egyptian frozen strawberries compared to the prices of competing countries in the Dutch market, as shown in Table (11), indicate that the export price of Egyptian frozen strawberries is lower than the prices of the competing countries in this market, which are Morocco and Poland. This means that Egyptian frozen strawberries in the Dutch market enjoy a price advantage compared to the other competing countries.

E- The Polish Market

The values of the price competitiveness index for Egyptian frozen strawberries compared to the prices of competing countries in the Polish market, as shown in Table (11), indicate that the export price of Egyptian frozen strawberries is lower than the prices of the competing countries in this market, which are Ukraine and Germany. This means that Egyptian frozen strawberries in the Polish market enjoy a price advantage compared to the other competing countries.

F- The Saudi Market

The values of the competitiveness index for frozen strawberries from Egypt compared to the prices of competing countries in the Saudi market (Table 11) show that the export price of frozen strawberries from Egypt is lower than the prices of the competing countries, Chile, and China. This means that frozen strawberries from Egypt enjoy a price advantage in the Saudi market compared to other competing countries.

From the above, the export prices of Egyptian frozen strawberries have a competitive price advantage compared to competing countries in the most significant importing markets. This provides opportunities for increasing exports to these markets while maintaining other non-price advantages such as quality, taste, export timing, and more.

4- Market Penetration Rate

The market penetration rate for a particular commodity is one of the most widely used measures to assess the competitive ability of a country in exporting that commodity, as it represents a measure of the extent to which the export commodity under study is absorbed by foreign markets.

Table 12. presents the market penetration coefficients for Egyptian frozen strawberries in the most important import markets during the period (2018-2022)

Year	Germany	Russia	China	Netherlands	Poland	Saudi Arabia
2018	0.123	0.053	0.001	0.149	0.045	0.16
2019	0.141	0.084	0.003	0.166	0.092	0.21
2020	0.143	0.087	0.003	0.133	0.12	0.189
2021	0.201	0.092	0.008	0.135	0.172	0.214
2022	0.227	0.109	0.009	0.18	0.193	0.216
average	0.167	0.085	0.005	0.153	0.124	0.198

Source: www.trademap.org ,,,,,www.fao.org

This also shows the extent to which exports of that commodity can be increased in those markets, and thus contributes to the development of foreign marketing policies for the commodity in each foreign market. The value of this indicator ranges from zero to one, and the higher the resulting value, the wider the market and the easier it is to enter, due to its heavy reliance on imports to meet domestic demand, and vice versa.

Calculating the penetration coefficient of Egypt's frozen strawberry exports to the important import markets during the period from (2018-2022) (Table 12), the value of the coefficient reached its highest in the Saudi market with an average of 0.198, meaning that 19.8% of the Saudi market's consumption of frozen strawberries is sourced from the Egyptian market. The German market ranks second with an average of 0.167, meaning that 16.7% of the German market's consumption of frozen strawberries is sourced from the Egyptian market. The Dutch market ranks third with an average of 0.153, meaning that 15.3% of the Dutch market's consumption of frozen strawberries is sourced from the Egyptian market. Then in fourth place is the Polish market with an average of 0.124, meaning that 12.4% of the Polish market's consumption of frozen strawberries is sourced from the Egyptian market. Then in fifth place is the Russian market with an average of 0.085, meaning that 8.5% of the Russian market's consumption of frozen strawberries is sourced from the Egyptian market. Then in sixth place is the Chinese market with an average of 0.005, meaning that 0.5% of the Chinese market's consumption of frozen strawberries is sourced from the Egyptian market, and the decline in the penetration coefficient in the Chinese market is due to the large size of production in this market, and therefore the low ability of Egyptian frozen strawberry exports to penetrate it.

From the above, it is evident that the penetration coefficients of Egyptian frozen strawberry exports to the important import markets are increasing, indicating an increase in the absorption capacity of these markets for Egyptian frozen strawberries, which requires considerable marketing efforts to maintain these markets and increase the market shares of Egyptian frozen strawberry exports.

Secondly: - Identifying the main factors affecting the competitive position of frozen strawberries from Egypt in the important markets using the gravity model.

The gravity model is of immense importance in the literature of international economics, especially with the growth and increase of international economic blocs, and it has been used by many countries to estimate the volume of foreign trade flows. The gravity model takes its name from Newton's law of gravity, which attributes the attraction between two bodies to their masses and inversely to the distance between them. ("The Potential of Bilateral Trade Between Egypt and Nile Basin Countries ...") This equation first appeared in a study by Tinbergen - one of the economists interested in integrative thought - and was followed by the first econometric study of trade flows based on the gravity equation conducted by Poyhonen and followed by the study of Lennemann.

The estimates in gravity models are based on the distance between "two countries", in addition to other economic variables for each of them. For the purposes of measuring the determinants of trade between two countries, the following model (equation number 1) will be:

(1) $$x_{ij} = G\frac{y_i y_j}{D_{ij}}$$

In this formula, (G) refers to a constant variable and (xij) refers to the trade flow (exports or imports between the countries), while (Dij) refers to the distance between the countries, and (yj) refers to the economic size of the country (i, j) which is measured and represented by the Gross Domestic Product. The equation can also be converted to a linear form for the purposes of econometric analysis by using logarithms, so that the linear equation for the gravity model of trade will be as follows (equation number 2):

(2) $$log(x_{ij}) = \alpha_0 + \beta_1 log(y_i) + \beta_2 log(y_j) + \beta_3 log(D_{ij}) + \varepsilon_i$$

Where β_one and β_two and β_three indicate the elasticity of foreign trade flows with respect to the size of the economies of the two countries (yi and yj) and the distance between them Dij. It is expected that the sign of the size of the economies will be (positive), while the sign of the distance between countries will be (negative).

Estimation of a Gravity Model for Exports of Frozen Strawberries from Egypt

1- The used model

The gravity model used for exports of Egyptian frozen strawberries is based on the Panel Data approach or what is known as cross-sectional time series data, which is a combination of cross-sectional data and time series data at the same time. This type of data is more useful in determining the appropriate relationship between variables over time. The Panel Data consists of a combination of time series data (six years from 2017 to 2022) and cross-sectional data, using the most

important countries importing frozen strawberries from Egypt, namely (Germany, Russia, China, Netherlands, Poland, Saudi Arabia). These countries represent about 59.9% of the total quantity of Egypt's exports of frozen strawberries to foreign markets. The panel data is also balanced, where T = N.

The mathematical model used includes the previous basic model reviewed, the distance between countries, and the impact of the size of the economies represented by the Gross Domestic Product. Additionally, some other variables are added, called the modified model, such as the common language, the import price of the countries importing from Egypt, and the average per capita GDP.

2- Estimation of the Gravity Model for Egyptian Frozen Strawberries

To identify the determinants of foreign trade for the important countries importing Egyptian frozen strawberries, three gravity models were estimated for the important importing countries of strawberries during the period (2017-2022). The estimated results were obtained using the equations (Table 13) using the EViews 13 program.

The basic model shown in Table 13 indicates that there is a positive relationship between the GDP of the importing countries and the GDP of Egypt, and the quantity of Egyptian exports of frozen strawberries, while there is an inverse relationship between distance and the volume of exports, which is in line with economic logic.

Specifically, a 1% increase in the GDP of the importing countries leads to a 0.26% increase in the quantity of Egyptian exports of frozen strawberries, and a 1% increase in Egypt's GDP leads to a 1.76% increase in the quantity of Egyptian exports of frozen strawberries. It is also clear that a 1% increase in distance leads to a 0.64% decrease in the volume of frozen strawberry exports. The adjusted R-squared for the model is about 0.44, meaning that the independent variables in the model are responsible for about 44% of the changes in the quantity of Egypt's exports of frozen strawberries.

Regarding the modified model (1), the second estimated model in Table 13, it is evident that there is a positive relationship between the GDP of the importing countries and Egypt's GDP, and the quantity of Egyptian exports of frozen strawberries, while there is an inverse relationship between distance and the import price of the countries from Egypt, and the quantity of Egyptian exports of frozen strawberries, which is in line with economic logic. However, the common language between Egypt and Saudi Arabia did not prove to be significant in terms of the volume of exports.

Table 13 Estimation of the gravity model for the important importing countries of Egyptian frozen strawberries during the period (2017-2022)

Model	Equation	R^{-2}	F
Model (1)	$Ln(Y) = 2.27 + 0.26\ Ln(X_{1)} + 1.76\ Ln(X_2) - 0.64\ Ln(X_3)$ (0.7) (2.29)* (4.72)** (-2.05)*	0.44	10.17**
Model (2)	$Ln(Y) = 14.49 + 0.43\ Ln(X_{1)} + 1.74\ Ln(X_2) - 0.69\ Ln(X_3)$ (3.1)** (3.53)** (5.37)** (-2.52)* $-\ 1.81\ Ln(X_4) - 0.34\ Ln(D_1)$ (-3.23)** (-1.57)	0.58	10.65**
Model (3)	$Ln(Y) = 22.35 + 0.43\ Ln(X_{1)} + 1.96\ Ln(X_5) - 0.69\ Ln(X_3)$ (5.27)** (3.52)** (5.3)** (-2.51)* $-\ 1.82\ Ln(X_4) - 0.34\ Ln(D_1)$ (-3.21)** (-1.55)	0.57	10.42**

Source: Calculated from the data in Table (14)
F: Model significance, R-2: Adjusted coefficient of determination,
*: Significance level at 0.05, **: Significance level at 0.01
Y1: Quantity of Egyptian exports of frozen strawberries in tons.
X1: Gross Domestic Product of the importing countries of frozen strawberries in billion dollars.
X2: Egyptian Gross Domestic Product in billion dollars.
X3: Distance between the two countries in kilometers.
X4: Import price of the countries for frozen strawberries from Egypt in dollar/ton.
X5: Average per capita Egyptian GDP in thousand dollars.
D1: Dummy variable representing the common language (Arabic takes the value 1, other language takes the value 0)

Table 14 presents the important economic variables used to estimate the gravity model for Egyptian frozen strawberries (2017-2022)

Time	Country	Exports (tons)	Gross Domestic Product of other countries (billion dollars)	Gross Domestic Product of Egypt (billion dollars)	Distance (km)	Average Egyptian per capita income (thousand dollars)	Import price of countries from Egypt (dollar/ton)
2017	Germany	5958	3690.85	248.36	7458.5	2.44	1086
2018	Germany	12254	3974.44	262.59	7458.5	2.53	1193
2019	Germany	14799	3889.18	318.68	7458.5	3.02	1172
2020	Germany	13595	3887.73	383.82	7458.5	3.57	1196
2021	Germany	16352	4278.5	424.67	7458.5	3.89	1203
2022	Germany	18846	4082.47	476.75	7458.5	4.3	1153
2017	Russia	4745	1574.2	248.36	8998.71	2.44	962
2018	Russia	7649	1657.33	262.59	8998.71	2.53	952
2019	Russia	10115	1693.12	318.68	8998.71	3.02	933
2020	Russia	8993	1493.08	383.82	8998.71	3.57	863
2021	Russia	10285	1836.89	424.67	8998.71	3.89	816
2022	Russia	13439	2240.42	476.75	8998.71	4.3	895
2017	China	1585	12310.49	248.36	14535.97	2.44	1623
2018	China	1833	13894.91	262.59	14535.97	2.53	1715
2019	China	5401	14279.97	318.68	14535.97	3.02	1542
2020	China	5451	14687.74	383.82	14535.97	3.57	1625
2021	China	13791	17820.46	424.67	14535.97	3.89	1587
2022	China	19724	17963.17	476.75	14535.97	4.3	1642
2017	Netherlands	2601	833.87	248.36	3756.36	2.44	1075
2018	Netherlands	6614	914.04	262.59	3756.36	2.53	1176
2019	Netherlands	10009	910.19	318.68	3756.36	3.02	1162
2020	Netherlands	9296	909.79	383.82	3756.36	3.57	1249
2021	Netherlands	7740	1029.68	424.67	3756.36	3.89	1174
2022	Netherlands	12198	1009.4	476.75	3756.36	4.3	1201
2017	Poland	1021	524.64	248.36	7992.53	2.44	1148
2018	Poland	2232	588.78	262.59	7992.53	2.53	1243
2019	Poland	6123	596.06	318.68	7992.53	3.02	1170
2020	Poland	5016	599.44	383.82	7992.53	3.57	1152
2021	Poland	8126	681.35	424.67	7992.53	3.89	1172
2022	Poland	14397	688.13	476.75	7992.53	4.3	1169
2017	Saudi Arabia	3949	714.99	248.36	6204.27	2.44	1003
2018	Saudi Arabia	5080	846.58	262.59	6204.27	2.53	973
2019	Saudi Arabia	6983	838.56	318.68	6204.27	3.02	1071
2020	Saudi Arabia	4832	734.27	383.82	6204.27	3.57	1122
2021	Saudi Arabia	3315	874.16	424.67	6204.27	3.89	1067
2022	Saudi Arabia	5813	1108.57	476.75	6204.27	4.3	1108

Source: www.trademap.org ,,,, www.fao.org ,,,,, https://www.searates.com ,,,,,www.albankaldawli.org

The model indicates that a 1% increase in the GDP of importing countries leads to a 0.43% increase in the quantity of Egyptian frozen strawberry exports. Similarly, a 1% increase in Egypt's GDP results in a 1.74% increase in the quantity of Egyptian frozen strawberry exports. It is also evident that a 1% increase in distance results in a 0.69% decrease in the quantity of frozen strawberry exports. Additionally, a 1% increase in the import price from Egypt leads to a 1.81% decrease in the quantity of frozen strawberry exports, indicating that this product has elastic demand in importing markets. This signifies that price changes significantly affect the quantity of Egyptian frozen strawberry exports in these markets. The adjusted coefficient of determination for the model was approximately 0.58, indicating that the independent variables mentioned in the model account for about 58% of the changes that occur in Egyptian frozen strawberry exports.

The modified model (2) in Table 13 shows that there is a positive relationship between the GDP of the importing countries and the average per capita income of Egyptians, and the quantity of Egyptian exports of frozen strawberries, while there is an inverse relationship between distance and the import price of the countries from Egypt, and the quantity of Egyptian exports of frozen strawberries, which is in line with economic logic. The common language between Egypt and Saudi Arabia also did not prove to be significant in terms of the volume of exports.

Moreover, with a 1% increase in the GDP of importing countries, the quantity of Egyptian frozen strawberry exports increases by 0.43%. A 1% increase in the average per capita GDP of Egyptians results in a 1.96% increase in the quantity of Egyptian frozen strawberry exports. It is evident that a 1% increase in distance results in a 0.69% decrease in the quantity of frozen strawberry exports, and a 1% increase in the import price from Egypt leads to a 1.82% decrease in the quantity of frozen strawberry exports. This indicates that frozen strawberries exhibit high demand elasticity in importing markets, meaning that price significantly influences the quantity demanded. The adjusted coefficient of determination for this model was approximately 0.57, suggesting that about 57% of the changes occurring in the quantity of Egyptian frozen strawberry exports can be attributed to the changes or independent factors studied in the model. Overall, the models studied indicate that price had the most significant impact on frozen strawberry exports in various models, underscoring the necessity of focusing on export pricing policies for this product and price competitiveness in importing markets. Additionally, the model showed that Egypt's GDP ranked second in terms of impact strength, followed by distance, and then the GDP of importing countries.

RECOMMENDATIONS

1- Focus on export pricing policies for this product.
2- Work on enhancing the penetration capacity of Egyptian frozen strawberry exports in importing markets, either by improving price competitiveness or by studying and enhancing other non-price competitive advantages such as contracts, taste, export timing, and international protocols.
3- Given the revealed comparative advantage of Egypt's frozen strawberry exports, this provides a competitive capability to open new markets.

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الملخص العربي

دراسة تحليلية للمركز التنافسي للفراولة المجمدة المصرية في أهم الأسواق الاستيرادية باستخدام نموذج الجاذبية

تُعد تنمية الصادرات الزراعية أحد المحاور الرئيسية لزيادة النقد الاجنبي، لعلاج العجز في ميزان المدفوعات، وتحسين الميزان التجاري الزراعي المصري. وتعد الفراولة المجمدة المصرية من المنتجات الزراعية التي يمكن ان تسهم في زيادة الصادرات المصرية، حيث تحظى في السنوات الأخيرة بطلب متزايد ونمواً ملحوظاً على المستوى العالمي نظرا لجودتها وتوافرها لفترات طويلة من السنة، وهو ما يؤكد القدرة على المنافسة في الاسواق الدولية. كما تتمثل مشكلة البحث انه على الرغم من النمو الملحوظ الذي شهدته صادرات الفراولة المجمدة المصرية في السنوات الأخيرة، الا أنها تواجه تحديات متعددة في الأسواق الاستيرادية، حيث تزايد عدد المنافسين في تلك الأسواق، بالإضافة إلى تطور قدرات الدول المنافسة وتحسين جودة منتجاتها وكفاءة التسويق والتوزيع. واستهدف البحث تحليل المركز التنافسي للفراولة المجمدة المصرية في أهم الأسواق الاستيرادية، وقد توصل البحث من خلال مؤشر الميزة النسبية الظاهرة أن محصول الفراولة المجمدة من المحاصيل الهامة التي تنافس بشدة في الأسواق العالمية. كما تشير نتائج مؤشر النصيب السوقي بأهم الأسواق الاستيرادية الى تزايده خلال الفترة من (٢٠١٨-٢٠٢٢)، وكانت الأنصبة السوقية تمثل نسب كبيرة وخاصة في حالة السوق السعودي والروسي. ويوضح مؤشر التنافسية السعرية للفراولة المجمدة المصرية أن أسعار تصدير الفراولة المجمدة المصرية ذات ميزة سعرية تنافسية بالمقارنة بالدول المنافسة في أهم الأسواق الاستيرادية. ويتبين من مؤشر معدل اختراق السوق تزايد معاملات اختراق صادرات الفراولة المجمدة المصرية لأهم الأسواق الاستيرادية، مما يبين زيادة قدرة استيعاب تلك الأسواق للفراولة المجمدة المصرية. واظهرت نتائج تحليل نموذج الجاذبية لأهم الدول المستوردة للفراولة المجمدة المصرية خلال الفترة (2017–٢٠٢٢)، أن هناك علاقة طردية بين كل من الناتج المحلي الاجمالي للدول المستوردة، الناتج المحلى الإجمالي لمصر، متوسط نصيب الفرد المصري من الناتج المحلي الإجمالي، وسعر استيراد الدول للفراولة المجمدة من مصر وبين كمية الصادرات المصرية من الفراولة المجمدة، بينما توجد علاقة عكسية بين المسافة وحجم الصادرات، أي أنه بزيادة المسافة تقل كمية الصادرات والعكس صحيح. وهذا يتمشى مع المنطق الاقتصادي، كما تبين أن السعر له أكبر تأثير على صادرات الفراولة المجمدة في النماذج المختلفة كما تبين أن الناتج المحلي المصري جاء في المرتبة الثانية من حيث قوة التأثير، ثم المسافة، ثم الناتج المحلي للدول المستوردة.