Research Article

MEASURING THE DEGREE OF MARKET POWER AMONG BROAD BEAN EXPORTERS TO EGYPT

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Abstract- Market power of exporting countries into a specific market is an important issue for decision makers within that market. It is also an important issue for exporting countries since it can be related to the ability of the country to increase its access to the market. Competitiveness indicators including; comparative advantage, market share, market penetration rate, instability coefficient of exports, competitiveness of export price, competitiveness of production, relative price, and relative stability of production in addition to residual demand model are used to measure the perfect competition conditions in the market and, accordingly, measure the market power of the different competitors. Australia, France, and UK are the more competitive exporting countries of Broad Bean to Egypt. However, China is a promising exporter with low prices and stable production.

Keywords- Market power, Competitiveness, Residual demand, Egypt, Bean

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Introduction

Food security has a major impact on the political and economic situation in any country. According to [1], this impact is very strong in the countries importing big portion of their food from international markets. Legumes are considered a main source of food in Egypt. Broad Bean is the major Legumes as it represents about two thirds of the legumes cultivated area. It's, also, popular food for most of the Egyptian. As [2] refers to; the increasing population and the declining cultivated area of legumes in general and Broad Bean resulting insufficient local production of these crops. In addition, productivity is getting lower. So, the self-sufficiency of Broad Bean in Egypt in 2015 accounted for only 30% according to [3]. Accordingly, many researchers including [4] consider it as critical and important product for Egypt where its imports according to [3] accounted for USD 4.78 billion representing 9.77% of Egypt total imports of food as an average for the period 2000-2015. Australia, France, and England are the biggest exporters to Egypt [5]. They exported 148, 98, and 84 thousand tons respectively representing 44%, 28%, and 21% of Egypt total imports according to [6,7].

Statement of Research Problem

As the imports of Broad Bean represents big portion of food imports and due to having only three countries exporting 93% of Egypt import, it's expected to have price pressure from their side because of their power. Thus, it's important to measure their monopolistic behavior [8]. It's, also, critical to keep eye on the market power of each exporter as they always seek to attain bigger market share [9] which might result a monopolistic behavior which will, accordingly, affect the balance of trade. This might be of a good support to policy makers.

Objectives of the Study

The study aims at measuring the market power and competitive advantage of the main exporters of Broad Beans to Egypt during the period 2000-2015. To achieve this goal, the study objectives are set to; highlighting the food gap and self-sufficiency of Broad Bean in Egypt, highlighting the geographical distribution of Egypt imports, estimating the competitive advantage of the main exporters to Egypt, and measuring the market power of the major exporters to Egypt.

Data Sources

Data for this study obtained from several sources including [1, 3, 6], in addition to the ministry of Agriculture and Land Reclamation.

Research Methodology

To achieve the study objectives, quantitative and qualitative analysis methods such as; averages, percentages, regression, trends, competitiveness indicators, and residual-demand model are used.

Competitiveness Indicators

Several competitiveness indicators are used to measure the power of each Broad Bean exporter into the Egyptian Market. Following are the indicators used for this research analysis.

Comparative Advantage

The comparative advantage is used to express the opportunities of expanding trade in the future. It indicates that a country has a comparative advantage when its value exceeds one. The indicator can be estimated according to the following formula [10];

$$R = (S / C) / (F / V)$$

Where;
S: value of the total exports by each exporting country into the Egyptian market per year.
C: total agricultural exports of each exporting countries into the Egyptian market per year.
F: value of total world exports per year.
V: value of total world agricultural exports per year.

Market Share

Market share represents the percentage of an industry or market's total sales that is earned by a company or country over a specified time. Increasing market share of a country is a main goal for developing exports and, accordingly, improves the competitiveness [11]. The indicator can be estimated according to the following formula;

$$N = (E / K) \times 100$$

Where;
E: quantity or value of exports to a specific country by each exporting country per year,
K: quantity or value of a country's total imports per year.

Market Penetration Rate

The penetration rate reflects the ability of the investigated market to accommodate the imports from a specific country. It can be estimated according to the following formula [12];

$$U = E / (H + K - T) \times 100$$

Where;
E: quantity of exports to a specific country by each exporting country per year.
H: quantity of a country's production per year.
K: a country's total imports per year.
T: a country's total exports per year.

Instability Coefficient of Exports

This coefficient is very important in judging the exporting policies of a specific crop; it measures the fluctuations in quantities, values, and prices of exports. It, also, reflects the commitment of a country to fulfill the requirements for exports and satisfying the international markets. Values are estimated by estimating the trends of the quantity, value or price of the exports over the study period. The coefficient is ideal when equal to zero and gets instable when more than zero.
The indicator can be estimated according to the following formula [13];

$$1 = Y - \hat{Y} / \hat{Y} \times 100$$

Where;
Y: real value of the quantity, value, or price of exports of each competitor per year.
$\hat{Y}$: estimated value of the quantity, value, or price of exports of each competitor per year.

Competitiveness of Export Price

This indicator reflects the competitiveness of a country's export price comparing to other countries' export prices. Value of the indicator ranges from zero to one. Competitiveness is high when the estimated value of the indicator increases. The indicator can be estimated according to the following formula [14];

$$P = (A - M) / (G - M)$$

Where;
A: ratio between the aggregated export price of all exporting countries and the exporting price for each individual exporting country per year.
M: lowest value of the ratios estimated in A per year.
G: highest value of the ratios estimated in A per year.

Competitiveness of Production

This indicator measures the competitiveness of an exporting country's production comparing to other competitors' production. Value of the indicator ranges from zero to one. Competitiveness is high when the estimated value of the indicator increases. The indicator can be estimated according to the following formula [15];

$$Q = (D - C) / (B - C)$$

Where;
D: ratio between the productions of each exporting country to the aggregated production of all exporting countries per year.
C: lowest value of the ratios estimated in D per year.

B: highest value of the ratios estimated in D per year.

Relative Price

The relative price compares a country's export price to other competitors' prices where countries usually try to gain advantages in a certain market by lowering export prices. Competitiveness of a country increases when the relative price is lower than one. The indicator can be estimated according to the following formula [16];

$$Z = F / W$$

Where;
F: export price of a country per year.
W: export price of each country per year.

Relative Stability of Production

This indicator reflects the power of exporting country against competitors in a certain market. Higher value of the indicator in a certain country refers to more production stability comparing to competitors. The indicator can be estimated according to the following formula [16];

$$J = (L / N) \times 100$$

Where;
L: production instability coefficient in a country.
N: production instability coefficient in competitive countries.

Residual Demand Model

The model estimates the elasticity of demand for a firm or a country in a competitive market [9]. There is a relationship between market power and the inverse elasticity of residual demand, where the residual demand facing an exporting country to a specific importing market is the total demand for that market minus the quantities exported by other countries [17]. The inverse elasticity of residual demand represents the relationship between a country's exporting price for a specific market and the quantity offered in that market taking into consideration that other countries are in the same market. The elasticity, in this case, represents the market power of the exporting country [18]. Significant elasticities indicate market power and the power increases as the elasticity increases [17].
The model can be describing according to [8] as following;

$$\text{Ln } P_i = a + y \ln q_i + d \ln (K / C) + \sum_{I=1}^{N} B \ln e_i$$

Where;
P: price of imported metric ton of a product from an exporting country.
Q: quantity of a product (in thousand metric tons) imported from the exporting countries.
K: national income of a country,
C: consumer price index in a country,
E: exchange rate for currencies of the exporting countries.
Ln: the natural logarithm.
I: competing exporting countries.
N: number of competing exporting countries.
a, y, d, and B: the parameters to be estimated.

Overview of Broad Bean in Egypt

The area cultivated with Broad Bean in Egypt significantly[*] declined from 270,000 feddans in 2000 to 145,000 feddans in 2015 as shown in [Fig-1] with an average declining rate of 4.99%. Although the productivity per feddan increased, however, the total production shown in [Fig-2] significantly declined from 365,000 tons in 2000 to 217,000 tons in 2015 with an average declining rate of 3.55%. Meanwhile, the total consumption has significantly increased from 543,000 tons in 2000 to 729,000 tons in 2015 with an average growth rate of 3.20%. Accordingly, the gap between production and consumption has significantly increased from 178,000

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 * Significant has been obtained from the trends' functions.

tons in 2000 to 215,000 tons in 2015 with an average growth rate of 3.27% and the self-sufficiency declined from 67% in 2000 to 30% in 2015.

To cover the shortage, Egypt had to widely outsource Broad Bean from different destinations. The total imports as shown in [Fig-1] has significantly increased from 201,000 tons in 2000 to 570,000 tons in 2015 with an average growth rate of 3.44%.

Exports of Broad Bean to Egypt

There are several exporting countries of Broad Bean to the Egyptian Market. The top five exporters are Australia, France, UK, China, and Turkey. The five countries export 96% of Egypt imports. To realize the development of exports by these countries to the Egyptian market, trend functions for the period 2000-2015 have been estimated for quantities, prices, and values of exports by the five countries. Coefficients of Variation (CV) for the three variables have been, also, estimated to realize the fluctuation in these variables for each country.
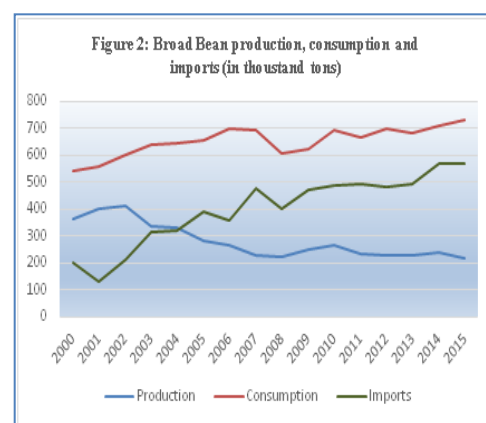
Development of Export Quantities

By estimating the trend functions for quantities exported by the five countries to the Egyptian market, [Table-1] shows that quantities exported by Australia, France, and UK have been significantly increased annually over the study period by 4.69, 3.12, and 3.42 thousand tons. As for China and Turkey, the quantities exported by them have been significantly decreased annually over the study period by 1.15 and 0.59 thousand tons. The estimated CVs indicates relative stability of Australia, France, and UK exports comparing to China and Turkey exports. The relatively low value of adjusted R^2 for Australia, France, and UK reflects several other variables rather than time affecting the quantities exported by these countries into the Egyptian market.
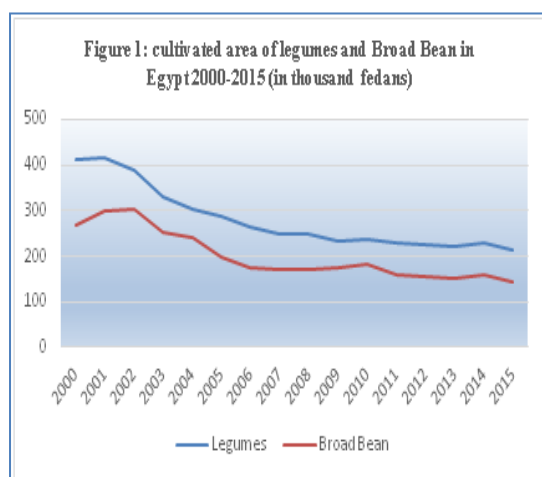
Source: compiled from [3]

Fig-2 Broad Bean production, consumption, and imports (in thousand tons)
Development of Export Prices

By estimating the trend functions for prices of exports by the five countries to the Egyptian market, [Table-2] shows that prices have been significantly increased annually over the study period by 13, 18.3, 18.3, 11.8, and 16.9 USs per ton for the five countries respectively. The estimated CVs indicate relative stability of prices from all countries.

Development of Export Values

[Table-3] shows the estimates of the trend functions for values of exports by the five countries to the Egyptian market. Values of exports of Australia, France, and UK have been significantly increased annually over the study period by 3.99, 2.78, and 1.98 million USD where values of exports by China and Turkey have been significantly decreased annually over the study period by 0.61 and 0.39 million USD. The estimated CVs indicate relative stability of Australia, France, and UK exports' values comparing to China and Turkey.

Results and Discussion
Estimates of Competitiveness Indicators of the Exporting Countries

The eight competitiveness indicators mentioned in the research methodology for the top five exporting countries of Broad Bean to Egypt have been estimated as an average of the period 1995-2012. [Table-4] shows the estimates of these indicators.

Source: compiled from [3]

Table-1 *trends of the broad bean export quantities by the top five exporters*

Exporter	Const.	β	Annual Rate of Change %	Coefficient of Variation %	T	F	R²
Australia	141.23	4.69	3.38	73	2.57	6.60	0.19
France	48.65	3.12	3.57	86	2.65	7.02	0.23
UK	34.13	3.42	4.06	79	3.11	10.23	0.29
China	27.54	(1.15)	(11.01)	119	8.02	64.33	0.72
Turkey	13.87	(0.59)	(12.03)	123	7.03	50.00	0.77

Source: compiled from [7]

Table-2 *trends of the broad bean export prices by the top five exporters*

Exporter	Const.	β	Annual Rate of Change %	Coefficient of Variation %	T	F	R²
Australia	401.6	13	2.13	44	0.33	17.72	0.33
France	366.4	18.3	2.79	41	0.59	36.12	0.59
UK	352.3	18.3	2.84	49	0.54	32.04	0.54
China	349.6	11.8	1.98	52	0.24	18.92	0.24
Turkey	361.1	16.9	2.65	47	0.56	32.60	0.56

Source: compiled from [7]

Table-3 *trend functions of the broad bean export value by the top five exporters*

Exporter	Const.	β	Annual Rate of Change %	Coefficient of Variation %	T	F	R^2
Australia	33.23	3.99	4.26	82	5.41	29.26	0.48
France	26.54	2.78	4.18	86	4.64	21.53	0.42
UK	19.45	1.98	3.80	89	4.65	21.62	0.43
China	12.43	(0.61)	15	142	2.01	4.04	0.19
Turkey	8.75	(0.39)	19	139	2.08	4.32	0.19

Source: compiled from [7]

Table-4 *competitiveness indicators of the top five exporting countries*

Indicators		Australia	France	UK	China	Turkey
Comparative Advantage		2.16	1.89	1.75	2.89	0.78
Market Share %	Quantity	33.54	29.65	28.74	7.25	3.52
	Value	34.96	30.69	29.61	5.69	2.51
Market Penetration Rate		16.34	14.28	11.19	2.99	1.41
Instability Coefficient of Exports	Quantity	4.25	5.43	4.33	30.64	26.34
	Price	6.27	6.75	7.65	5.25	5.24
	Value	10.64	11.54	10.32	28.56	25.36
Competitiveness of Export Price		0.60	0.58	0.49	0.74	0.76
Competitiveness of Production		0.72	0.65	0.62	0.83	0.69

Source: compiled from [6] and [7]

The estimates of the comparative advantage refers to China having the highest comparative advantage followed by Australia, France, and UK while Turkey are not shown to have a comparative advantage in exporting Broad Bean to Egypt. The market share for both quantities imported by Egypt and the value of imports, also, refers to higher market shares for Australia, France and UK aggregating 92% and small market shares for China and Turkey. The same conclusion can be applied to the market penetration rate where the Egyptian market is able to highly accommodate the import of Broad Bean from Australia, France, and UK but not from China and Turkey. The estimates of the instability coefficient of exports of the five countries reflect the relative commitment of Australia, France, and UK to fulfill the required imports by Egypt comparing to China and Turkey. Export prices of China and Turkey are shown be relatively competitive comparing to Australia, France, and UK. As for the relative prices; [Table-5] shows the relative price of each country comparing to other countries' prices. In general, competitiveness of China and Turkey are higher comparing to other countries due to the relatively low relative prices. France and UK seem to be more competitive than Australia due to relatively lower relative prices. The results, also, show a high potential for China as an exporter of Broad Bean due to the higher relative stability of production comparing to other competitors.

Table-5 *relative price and relative stability of production of the top five exporting countries*

Indicator		Australia	France	UK	China	Turkey
Relative Price	Australia	-	0.96	0.94	1.11	1.09
	France	1.04	-	0.99	1.07	1.07
	UK	1.06	1.01	-	1.06	1.09
	China	0.89	0.93	0.94	-	0.99
	Turkey	0.91	0.93	0.91	1.01	-
Relative Stability of Production	Australia	-	0.94	0.99	1.42	0.96
	France	1.12	-	1.01	1.33	0.97
	UK	1.02	1.01	-	1.41	0.99
	China	0.90	0.89	0.90	-	0.91
	Turkey	1.03	0.94	0.98	1.34	-

Source: compiled from [6] and [7]

Estimates of Residual Demand Model of the Exporting Countries

Estimates for the residual demand functions for the five countries exporting Broad Bean to Egypt have been conducted. Variables entered into the model included import prices of Broad Bean as endogenous variables, quantities exported by each country to the Egyptian market, Growth Domestic Product (GDP) of Egypt, exchange rates between the Egyptian currency and currencies of the exporting countries, and time as exogenous variables [8]. The main purpose of estimating the model is to obtain the values of the inverse elasticities of demand as indicators for the market power of an exporting country against other competitors. The logarithmic form is used to estimate the inverse elasticities of demand. The model has been estimated based on the data series 2000-2015 for the top five exporting countries of Broad Bean to Egypt. The Seemingly Unrelated Regression (SUR) approach is used to obtain estimates for the residual demand model [Table-6] represents the estimates of the variables affecting the price of the imports from each of the five countries.

Estimates of the inverse residual demand elasticities for Australia, France, and UK refer to positive insignificant values where the values for both China and Turkey are negative and statistically significant [Table-6], also, shows that the increase in the Egyptian national income results and increase of the import price of Broad Bean from the five countries. However, the price of Australia, France, and UK increase by relatively greater values comparing to China and Turkey. Results, also, show that the increase in exchange rates between the Egyptian Pound and EURO & Sterling Pound affects the price of imports with higher percentage comparing to other exporting countries.

Table-6 *estimates of the residual demand model for Broad Bean*

	Variables								Statistics	
	Const.	Ln q	Ln N	Ln e_1	Ln e_2	Ln e_3	Ln e_4	Ln e_5	F	R^2
Australia (1)	4.76 (1.11)	0.11 (2.45)	3.01 (1.23)	1.11 (3.98)	3.08 (3.75)	3.75 (1.44)	1.11 (0.99)	0.89	21.99	0.81
France (2)	(4.11) (0.91)	0.10 (3.01)	3.22 (1.52)	1.19 (3.46)	3.71 (4.52)	3.11 (1.74)	1.17 (1.06)	1.01	25.66	0.85
UK (3)	(4.23) (0.77)	0.09 (2.26)	2.97 (1.36)	1.17 (3.22)	3.10 (3.69)	2.65 (0.97)	1.08 (0.88)	0.88	16.75	0.69
China (4)	2.85 (2.59)	(1.06) (2.47)	1.71 (1.03)	1.07 (2.11)	2.13 (3.01)	1.97 (0.51)	0.63 (0.12)	0.55	17.32	0.78
Turkey (5)	1.99 (2.74)	(1.02) (2.59)	1.09 (0.97)	1.04 (3.08)	1.17 (3.01)	1.14 (0.91)	0.33 (0.51)	0.22	19.85	0.84

Source: compiled from [7], [19], and [20].
Where; q: quantity of Broad Bean imported from each country,
N: national income of Egypt at constant prices, e: exchange rate of Egypt currency to the exporting countries' currencies,
Ln: the natural logarithms.

Discussions

Determining the market power of specific exporting country over a specific market means judging whether the market is a perfect competition market or marked with monopolistic practices requires several measures to be undertaken. The competitiveness indicators are one way to measure that and the inverse residual demand elasticity's is the other way used in this paper to measure the market power. Most of the competitiveness indicators presented previously refer to Australia, France, and UK to be competitive exporters of Broad Bean to the Egyptian market which reflect, to some extent, a perfect competitive market. In addition, the inverse residual demand elasticities for the three countries are shown to be positive and insignificant which reflect, also, a perfect competitive market. Hence, the three countries can't increase their export prices of Broad Bean to Egypt without losing their market shares.

Competitiveness of the export prices for China and Turkey are higher comparing to other countries due to the low relative prices which indicates a good potential for them to increase their market share within the Egyptian market. Considering that the competitiveness of China production and its relative stability supports the previous assumption. However, the inverse residual demand elasticity is negative and significant which defeat the potentiality. The conflict reflects inaccuracy in decision making regarding the imports of Broad Bean.

Unfortunately, the increase in Egypt national income and the decline in exchange rate of the Egyptian pound to the currencies of the exporting countries will result increase in import prices of Broad Bean which coincide with economic theory.

Overall, it can be said that the exporting countries of Broad Bean to Egypt are relatively competitive and none of them have absolute power over the Egyptian market.

Conclusion

Broad Bean is the major Legumes consumed in Egypt as it represents about two thirds of the legumes cultivated area. It's, also, popular food for most of the Egyptian. The self-sufficiency of Broad Bean in Egypt in 2015 accounted for only 30% and its imports accounted for 4.78 billion USD representing 9.77% of Egypt total imports of food as an average for the period 2000-2015 sourced mainly from Australia, France, UK, China, and Turkey. The five countries export 96% of Egypt total imports of Broad Bean. Competitiveness indicators and residual-demand model are used to measure the market power of the exporting countries of Broad Bean to Egypt. Export prices, quantities exported, and values of exports by the five countries significantly increased over the study period 2000-2015. Australia, France, and UK are shown to have comparative advantages and more able to penetrate the Egyptian market comparing to China and Turkey. They are, also, more committed to fulfill the required imports by Egypt. Competitiveness of the export prices for China and Turkey are higher comparing to other countries due to the low relative prices. The competitiveness of China production and its relative stability reflects the potentiality of China to be a major exporter of Broad Bean to Egypt. A perfect competition conditions dominates the market as the inverse residual demand elasticities for the top three countries are shown to be positive and insignificant.

It's recommended that Egypt government benefit from the situation through;

1. **Diversify** the imports of Broad bean to maximize the benefit of the perfect completion condition.
2. **Substitute** portions of the imports from Australia, France, and UK with imports from China to benefit from the competitive price and stable production

Author Contributions: All author equally contributed

Abbreviations

GDP: Growth Domestic Product
SUR: Seemingly Unrelated Regression

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: None declared

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