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ORIGINAL ARTICLES

An Econometric Model for the Egyptian Cotton Market

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ABSTRACT

The aim of this subject of research is to identify the possibility of improving the productive and export of Egyptian cotton, through study of the factors affecting all aspects of consumption, exports, inventory and supply - production plus stock - for the cotton crop in Egypt. The results of the study findings are the positive effect of each of the quantity consumed of all varieties of cotton in the previous year and real income per capita and the total dollar amount of domestic production and the negative impact of the sale price of a ton of hair romanced local quantity consumed of these items. The results also show that the height of each of the world price and domestic production, the average export price per ton of American pima cotton, the average export price of Sudanese cotton varieties studied, and the exchange rate leads to increase in the quantity exported from Egyptian cotton, to increase in the export price and the amount consumed by these items leads to a decrease in the exported quantity. As it turns out the positive impact of domestic production of cotton varieties on the amount of stocks. As well as the results show the positive impact of farm price of cotton varieties on the quantity before them and by encouraging farmers to expand the area cultivated with cotton. Therefore, the study recommends the need to support producers of Egyptian cotton to achieve a balance between the prices of factors of production and farm price, with the need to work on the trend towards the export of cotton in the form of manufactured products to increase the added value of the export of Egyptian cotton.

Key words: An Econometric Model, Egyptian Cotton, Egyptian cotton production, cotton export, local and international market supply.

Introduction

Cotton is considered one of the important strategic crops, where it has an effective influence on national income. Cotton contributes to agriculture total income 2.5% which equal about 4.8% of total plant production; cotton export value is about 3.9% of total Egyptian exportation "except petroleum oil". Regarding to agriculture exportation value cotton contribute by 36.6% that consider about 53.7% of total raw material exportation as average of 2000-2009 years. Also cotton a main raw material of the textile industry which is considered the first important industry in Egypt. Cotton seeds also are used in oil manufacture and animal feed industries, which are fully needed especially to minimize importing of oil and animal feed that cost Egyptian economy a lot by hard currency.

Research Problem:

Presently Egyptian cotton production and exportation are going decreasing, that actual the main subject of this investigation. The cultivated area of cotton is going lower year by year, in spite of its importance for national economy, textile industry, food oil, animal feed production and also its role in increasing and maintenance of soil fertility. Egyptian statistics indicates decreasing of cotton cultivated area from 993 thousand feddan (9200 m2) on 1990 year to about 312 thousand feddan on 2009 year, with decreasing percent of about 68.6 that lead to a decrease in cotton production by about 68.5% in 2009 year comparing with the year 1990. The decrease of cotton production in recent years has a negative reflection on local and international market supply.

Aim of the research is to recognize the possibility of improving the productivity and exportation level of Egyptian cotton, through studying the factors affecting consumption, exportation inventory and supply of Egyptian cotton.

The Way Research and Data Sources:

The investigation method mainly depends on the secondary published and unpublished data a long 1990-2009 period. Data was obtained from the Egyptian Ministry of Agriculture, USDA website, International Cotton

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Adivisor Committee (ICAC), United Nation (UN) and FAO. An econometric standard model of Egyptian cotton market was used in this investigation. The used model consists of four structural equations included internal and external variables. The internal variables are domestic consumption, amount of Egyptian exports, stock and domestic supply amount of Egyptian cotton. Meanwhile the external variables were determined outside the model depending on other factors other than the model balance, such as the Egyptian production amount, exporting price average, actual personal income, exchanging price, teruned cotton price, pima cotton exporting price for USA, Sudan cotton exporting price, international cotton price, Egyptian cotton farm price and Egyptian cultivated area

The Mathematical Formula Of The Form:

1- Consumption Equation

$$QC_t = \alpha + b_1\, QC_{t-1} + b_2\, RDI_t + b_3\, PC_t + b_4\, QP_t$$

2- Export Equation

$$QEX_t = \alpha + b_1\, PE_t + b_2\, QP_t + b_3\, QC_t + b_4\, PCUS_t + b_5\, PCS_t + b_6\, PCW_t + b_7\, ER_t$$

3- Inventory Equation

$$Qinv_t = \alpha + b_1 QC_t + b_2\, PE_t + b_3 QP_t$$

4- SUPPLY Equation

$$Q\, S_t = \alpha + b_1\, PF_{t-1} + b_2\, ar_t + b_3\, QEX_t$$

Definition The Form Variables:

Endogenous variables:
QCt = total amount of domestic consumption of studied cotton in thousand tons / year t
QEXt = total amount of exports of studied cotton in thousand tons / year t
Qinvt = total amount of the stock of variety studied cotton in thousand tons / year t
QSt = total amount of domestic supply of variety cotton in thousand tons / year t
Exogenous variables:
QPt = total quantity of production of cotton variety studied in thousand tons / year t
PEt = average export price of ton of cotton variety studied in dollars / year t
RDIt = real per capita income in dollars / year t
PCt = average price per ton of cotton fibers variety of the spindles converted in dollars / year t
PCUSt = average export price of ton of American Pima cotton in dollars / year t
PCSt = average export price of tons of long staple Sudanese cotton in dollars / year t
PCWt = world price per ton of cotton variety studied in U.S. dollar / year t
ERt = exchange rate of dollar to Egyptian pound / year t
PFt = farm price per ton of cotton variety studied in dollars / year t
Art = the total cultivated area of cotton variety studied in thousands of acres / year t

Many equations have been carried out in order to reach the best version of a model consistent with economic logic and check the conditions of class and grade for the model. It was found that the method of least squares in three stages (3SLS) are the best methods to estimate the parameters of the model as applied to the sample as a whole and not to a single equation, as it gives more accurate results for the overall effects of the independent variables. In addition, the elasticities estimated in this way be more efficient.

This study assumes that the amount of domestic consumption of cotton variety in the consumption function in that class in the previous year, real per capita income, the average price per ton of it for the spindles, and the amount produced in the same year. The study assumes that the quantity exported from the Egyptian cotton is a function in the export price per ton hair of it, the amount of domestic production, the amount of domestic consumption, export price of cotton American pima cotton and Sudanese cotton competitors for Egyptian cotton in global markets, the world price of cotton variety studied, and the exchange rate of U.S. dollar to L.E.. Assuming that the amount of inventory function of cotton variety is a function in the amount of domestic consumption of it, its export price, the amount of domestic production. It also means that the amount of

domestic supply of cotton variety is a function in the farm price in the previous year, and the cultivated area and the quantity exported from the same year.

Research Results:

Results Estimated From The Standard Model Of Cotton Crop:

The estimated standard form used for each of the varieties of cotton - long-staple, extra high length - in addition to the total Egyptian cotton during the period (1990-2009).

The results of models estimated the lack of appreciation of the problems - self-association, heterogenity, non-normal distribution - can affect the efficiency of the models. As it turns out all the moral equations models estimated statistically at the level of 0.01 according to test F.

The Results Of Estimating The Standard Model Of Long-Staple Cotton:

Table (1) assessing the results of the standard model of long-staple cotton, which include both the consumption and exports, inventory and supply.

First, Consumption Of Long-Staple Cotton:

The above table revealed that transactions signals match with the estimated economic logic, where show a direct correlation between the quantity consumed of long-staple cotton in thousand tons and all of the amount consumed than in the previous year and per capita real income and the total dollar amount of domestic production in thousand tons of it. Also found an inverse relationship between quantity consumed of long-staple cotton in thousand tons and the sale price of a ton of hair spindles local dollar. This indicates that the change of variables by the previous unit leads to a change quantity consumed of long staple cotton by about 0.18, 3.8, 0.29, -0.026 thousand tons respectively. And these variables explain about 76% of the changes in the quantity consumed of long-staple Egyptian cotton.

The values indicate the estimated elasticities in Table (2) that the increase of real per capita income by 10% leads to increased consumption of long-staple cotton in the form of clothing increased by 7.15%. While the increase in selling price of the spindles of the local long-staple cotton by 10% leads to a decrease from the amount consumed by 17.4%. This indicates that the high price of a ton of cotton spindles as the demand for cotton is derived from the demand for clothing leads to a reduction of the amount consumed cotton.

Second, Exports Of Long Staple Cotton:

Estimations in Table (1) pointed to matching of the estimated transaction with economic logic. It was found a positive relationship between the quantity exported from long staple Egyptian cotton in thousands of ton and each of the world price is in dollars, and domestic production of it in thousand tons, the average export price of ton of U.S. pima cotton in dollar, the average export price of long-staple Sudanese cotton in dollars and the exchange rate. Also it was found an inverse relationship between the quantity exported from long staple Egyptian cotton and each of the amount of domestic consumption and export price of it in dollars per ton. This indicates that the change of variables by the previous unit leads to a change quantity exported from long staple cotton by about 0.03, 0.09, 0.01, 0.11, 0.55, -0.31, -0.02 thousand tons, respectively. And that these variables explain about 88% of the changes in the amount of exports of long staple cotton in the same year.

Also the values of elasticities estimated in Table (2) indicate that the increase of the export price of American pima cotton and the export price of Sudanese long-staple cotton and the world price and exchange rate by 10% leads to increase of the quantity exported from Egyptian long staple cotton by about 52.02%, 35.78% , 8%, 4.93%, respectively, while the increase in export price of long staple Egyptian cotton by 10% leads to lowering the quantity exported by about 6.58%.

Third, The Stock Of Long-Staple Cotton:

The results of the model estimated for the stocks of Egyptian long-staple cotton which are described in Table (1) match signals transactions with estimated economic logic, as it shows a direct correlation between the amount of the stock of long-staple cotton and the amount of domestic production of it. Also it was found an inverse relationship between the amount of the stock of each product and the amount of domestic consumption of it and the average export price of long staple Egyptian cotton. This indicates that a change of the previous variables by one unit leads to a change of the amount of the stock of long-staple cotton by about 0.45, -0.19, -0.65 thousand tons, respectively. This explains the changes in these variables by about 79% of the changes in the amount of the stock of long-staple cotton at the end of the year.

The estimated elasticities in Table (2) indicate that the increase of export price per ton of long staple cotton by 10% leads to a decrease in the amount of the inventory by 19.32%.

Fourth, The Supply Of Long Staple Cotton:

Estimations in Table (1) match the estimated transaction with economic logic, it is clear that there is a direct correlation between the amount offered by the long-staple cotton in thousand tons and the cultivated area of it, and the farm price in pounds in the previous year. It also showed an inverse relationship between the amount offered in the local market of long-staple cotton and the amount of exports from it. This indicates that the change of the previous variables by one unit leads to a change amount of the supply of long staple cotton by 0.65, 0.08, -0.1 thousand tons, respectively. The changes in these variables explain 82% of the amount of changes in the supply of cotton.

The values of the estimated elasticities in Table (2) indicate that the increase in the farm price in the previous year by 10% leads to an increase the supply of long staple cotton by 8.67%, and indicates that the increase in farm price in the previous year leads to an increase in the domestic production by increasing both the cultivated area and productivity in the following year and then increase the supply of cotton in the following year.

Table 1: Equations of consumption and export, inventory and supply of long staple Egyptian cotton, using the standard model during the period (1990-2009).

Consumption Equation $QC_t = 128.13 + 0.18\ QC_{t-1} + 3.8\ RDI_t - 0.026\ PC_t + 0.29\ QP_t$ (1.61) (7.77) (9.7) (-3.09) (2.97) R2 = 0.76 D.W = 1.14 F= 26.37
Export Equation $QEXt = 292.8 - 0.02\ PE_t + 0.09QP_t - 0.31\ QC_t + 0.\ 01PCUS_t + 0.111PCS_t + 0.03PCW_t + 0.55ER_t$ (6.4) (-2.4) (3.75) (-3.3) (8.05) (2.3) (9.92) (3.28) $R^2 = 0.88$ D.W = 1.34 F = 36.7
Inventory Equation $Qinv_t = 178.7 - 0.19\ QC_t - 0.65\ PE_t + 0.45\ QP_t$ (3.32) (-3.14) (-2.8) (8.15) R2 = 0.79 D.W = 0.92 F= 42.52
Supply Equation $QS_t = 178.08 + 0.08\ PF_{t-1} + 0.65\ ar_t - 0.1\ QEX_t$ (2.7) (0.94) (8.17) (-5.14) R2 = 0.82 D.W = 1.73 F= 68.7

Source: collected and calculated from: Reference No. 1.2, 3, 4.5.

Table 2: The results of the estimated elasticities of the quantity of consumption, exports, inventory and supply of long staple Egyptian cotton, using the standard model during the period (1990-2009).

	ER_t	PF_t	PCW_t	$PCUS_t$	PCS_t	PE_t	RDI_t	PC_t
QC_t							0.715	-1.74
QEX_t	0.493		0.8	5.205	3.578	-0.658		
$QINV_t$						-1.932		
QS_t		0.867						

Source: collected and calculated from the results of the study estimated the standard model.

Estimated Results Of The Standard Model For Extra Long Fiber Cotton:

Table (3) assessing the results of the standard model extra long fiber cotton, which includes both consumption and exports, inventory and supply.

First, consumption of extra long fiber cotton:

It is seen from the above table that transactions signals match with the estimated economic logic, where it showed a direct correlation between the quantity of cotton consumed in thousand tons of high length and the consumed amount than in the previous year and per capita real income in dollar, and the total amount of domestic production in thousand tons. Also found an inverse relationship between the quantity of consumed high length cotton per thousand tons and the sale price of a ton of hair spindles from the local dollar. And these variables explain about 77% of the changes in the quantity consumed of the Egyptian super length cotton.

The values indicate the estimated elasticities in Table No. (4) that the increase of real per capita income by 10% leads to increased consumption of super length cotton in the form of clothes by 5.18%. While the increase in selling price per ton of it for local spindles by 10% leads to a decrease in the amount consumed by 12.78%.

Second, Exports Of Cotton High-Length:

Estimatipns in Table (3) match the estimated transaction with economic logic. It was found a positive relationship between the quantity exported from Egyptian cotton super length and every thousand tons of domestic production of it, the average export price of U.S. pima cotton t the dollar, the average export price of Sudanese super length cotton in high dollar, the world price and exchange rate. Also found an inverse relationship between the quantity exported from the super length Egyptian cotton and the amount of domestic consumption and export price of it. This may explain the inverse relationship between the quantity exported and the export price of Egyptian super length cotton to the high export price for the Egyptian world price. The variables that explain about 87% of the changes in the amount of exports of super length cotton in the same year.

Also the values of elasticities estimated in Table No. (4) indicate that the increase of the export price of American pima cotton and the export price of cotton, the Sudanese and the world price and exchange rate by 10% leads to an increase the quantity exported from Egyptian super length cotton by about 24.36%, 50.1%, 2.87 %, 5.99%, respectively. While the increase in export price of Egyptian high length cotton by 10% lowers the quantity exported by about 7.16%.

Third, The Stock Of Super Length Cotton:

The results of the model is estimated stock of Egyptian super length cotton and described in Table (3) match signals transactions with estimated economic logic, as it shows a direct correlation between the amount of the stock of super length cotton and the amount of domestic production of it. At the same time, which shows an inverse relationship between the amount of the stock of the considered product and each of the amount of the domestic consumption, the average export price of Egyptian super length cotton. These variables explain about 82% of the changes in the amount of inventory of super length cotton at the end of the year. The values of the estimated elasticities in Table No. (4) indicate that an increase the price of extra of high length cotton by 10% leads to lower the amount of inventory of it by 12.9%.

Fourth, The Supply Of High-Length Cotton:

Estimations in Table (3) match the estimated transaction with economic logic, it is clear that there is a direct correlation between the quantity of cotton displayed in thousands of tons of high length of the cultivated area and the farm price in pounds in the previous year, like it shows an inverse relationship between the amount offered in the local market of super length cotton and the amount of exports from it. And these variables explain about 76% of the amount of changes in the supply of cotton.

The estimated elasticities in Table No. (4) indicate that the increase in the farm price in the previous year by 10% lead to increase the supply of super length cotton by 9.53%.

Table 3: Equations of consumption and export, inventory and the supply of Egyptian cotton high length using the standard model during the period (1990-2009).

Consumption Equation $QC_t = 34.75 + 0.34\ QC_{t-1} + 0.92\ RDI_t - 0.31PC_t + 0.09\ QP_t$ (2.04) (7.96) (11.72) (-4.40) (3.92) R2 = 0.77 D.W = 2.01 F= 40.98
Export Equation $QEXt = 11.67 - 0.06\ PE_t + 0.05QP_t - 0.35QC_t + 0.025PCUS_t + 0.05PCS_t + 0.06PCW_t + 0.42ER_t$ (3.46) (-2.98) (5.37) (-3.57) (2.5) (2.2) (8.02) (3.9) $R^2 = 0.89$ D.W = 1.38 F = 55.13
Inventory Equation $Qinv_t = 63.52 - 0.04\ QC_t - 0.03\ PE_t + 42\ QP_t$ (3.5) (-3.35) (-2.9) (8.59) R2 = 0.82 D.W = 1.21 F= 69.54
Supply Equation $QS_t = 137.8 + 0.015\ PF_{t-1} + 0.3\ ar_t - 0.013\ QEX_t$ (4.25) (2.83) (3.07) (-7.9) R2 = 0.76 D.W = 0.92 F= 93.15

Source: collected and calculated from: Reference No. 1.2, 3, 4.5.

Table 4: The results of the estimated elasticities of the quantity of consumption, exports and inventory and the supply of Egyptian high length cotton using the standard model during the period (1990-2009).

	ER_t	PF_t	PCW_t	$PCUS_t$	PCS_t	PE_t	RDI_t	PC_t
QC_t							0.518	-1.278
QEX_t	0.599		0.287	2.436	5.01	-0.716		
$QINV_t$						-1.29		
QS_t		0.953						

Source: collected and calculated from the results of the study estimated from the standard model.

Results Estimated From The Standard Model Of Total Egyptian Cotton:

Table (5) indicates the results of the standard model to estimate the total cotton crop, which includes both consumption and exports, inventory and supply.

First, The Total Consumption Of Cotton:

It is seen from the above table that transactions signals match with the estimated economic logic, which show a direct correlation between the quantity consumed of the total cotton in thousand tons and each of the amount consumed in the previous year, per capita real income and the total dollar amount of domestic production in thousand tons. Also an inverse relationship between quantity consumed of the total cotton thousand tons and the sale price per ton of hair from the local spindles in dollar. And these variables explain about 79% of the changes in the quantity consumed of the total Egyptian cotton.

The values of the estimated elasticities in Table No. (6) indicate that the increase of real per capita income by 10% leads to increased consumption of cotton in the form of clothes increased by 3.28%, while the increasing of price of the local spindles of cotton by 10% leads to a decrease from the amount consumed by 1.73%.

Second, The Total Exports Of Cotton:

Estimations in Table (5) match the estimated transaction with economic logic. It was found a positive relationship between the quantity exported of the total Egyptian cotton in thousand tons of domestic production and each of it, the average export price of U.S. pima cotton in dollars, the average export price of Sudanese cotton in dollar, the world price and exchange rate. Also an inverse relationship between the quantity exported from Egyptian cotton and each of the amount of domestic consumption and export price from the Egyptian cotton. The variables that explain about 90% of the changes in the amount of exports of cotton in the same year.

Also the values of elasticities estimated in Table No. (6) indicate that the increase of the export price of American pima cotton, the export price of the Sudanese cotton, the world price and exchange rate by 10% leads to increase in the exported quantity of the total Egyptian cotton by about 17.35%, 22.67%, 16.62% , 6.1%, respectively. While the increase in export price of cotton by 10% leads to lower quantity exported by about 7.37%.

Third: Stock Of The Total Cotton:

The results of the model estimated for the stocks of the total Egyptian cotton described in Table (5) match signals transactions with estimated economic logic, as it shows a direct correlation between the amount of the stock of cotton and the amount of domestic production of it. At the same time, it shows an inverse relationship between the amount of the stock of each product and the amount of domestic consumption of it, the average export price of Egyptian cotton. And explain the changes in these variables about 78% of the changes in the amount of the total stock of cotton at the end of the year.

The estimated elasticities in Table No. (6) indicate that an increase of the export price of Egyptian cotton by 10% leads to decrease the amount of inventory by about 8.94%.

Table 5: Equations of consumption and export, inventory, total supply of Egyptian cotton by using the standard model during the period (1990-2009).

Consumption Equation $QC_t = 39.35 + 0.34\ QC_{t-1} + 0.2.12\ RDI_t - 0.16PC_t + 0.44\ QP_t$ (0.75) (2.93) (7.58) (-10.15) (5.69) R2 = 0.90 D.W = 2.49 F= 34.72
Export Equation $QEXt = 328.4 - 0.019\ PE_t + 0.22QP_t - 0.43QC_t + 0.\ 03PCUS_t + 0.09PCS_t + 0.06PCW_t + 0.31ER_t$ (4.73) (-2.95) (3.16) (-3.82) (6.17) (8.2) (10.62) (5.2) $R^2 = 0.69$ D.W = 1.49 F = 23.91
Inventory Equation $Qinv_t = 258.3 - 0.73\ QC_t - 0.03\ PE_t + 0.64\ QP_t$ (3.97) (-9.98) (-4.87) (6.23) R2 = 0.75 D.W = 0.42 F= 30.41
Supply Equation $QS_t = 373.12 + 0.03\ PF_{t-1} + 0.41\ ar_t - 0.07\ QEX_t$ (3.69) (2.358) (4.72) (-3.6) R2 = 0.89 D.W = 0.92 F= 27.55

Source: collected and calculated from: Reference No. 1.2, 3, 4.5.

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Fourth: The Total Supply Of Cotton:

Estimations in Table (5) match the estimated transaction with economic logic, it is clear that there is direct correlation between the amount of the total cotton in thousands of tons, cultivated area of it, and the farm price in pounds in the previous year. It showed an inverse relationship between the amount offered in the local market and the quantity of cotton exports from it. The changes in these variables explain 85% of the amount of changes in the supply of cotton.

The estimated elasticities in Table No. (6) indicate that the farm price increase in the previous year by 10% leads to increase the supply of cotton by 8.05%.

Table 6: The results of the estimated elasticities of the quantity of consumption, exports, inventory and supply of the total Egyptian cotton using the standard model during the period (1990-2009).

	ER_t	PF_t	PCW_t	$PCUS_t$	PCS_t	PE_t	RDI_t	PC_t
QC_t							0.328	-0.173
QEX_t	0.61		1.662	1.735	2.267	-0.737		
$QINV_t$						-0.894		
QS_t		0.805						

Source: collected and calculated from the results of the study estimated the standard model.

Conclusion:

The results indicate the importance of the impact of farm price in a resolution expanding the area of cotton crop and then the impact on supply. Also shows the strong competition for each of the American Pima cotton varieties, cotton varieties for the Sudanese and Egyptian cotton, which had enjoyed a comparative advantage and the highly competitive global markets. And that decline may be due to the steady increase in production costs. Therefore, the study recommends the need to support producers of Egyptian cotton to achieve a balance between the prices of factors of production and farm price, the need to work with the trend towards the export of cotton in the form of manufactured products to increase the added value of the export of Egyptian cotton.

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