A Standard Model for the Impact of Policies on the Egyptian Production and Consumption of Frozen Vegetables, Juices and Syrups

Yehia Mohamed Khalil[1], Mahmoud Alaa Abdelaziz[1], Amr Sayed Sofey El Sayed[2], Sabry Badr Abdelmoaty Dabbous[2] and Mohamed Nasr Elden Helmy[3]

[1]Department of Agricultural Economics, National Research Centre, Dokki, 12622, Giza, Egypt.
[2]Agricultural Economics Research Institute, Agricultural Research Center, Egypt
[3]Department of Agricultural Economics, Al-Azhar Univ., Assiut, Egypt.

ABSTRACT

Agricultural industries are considered one of the important industries in countries with agricultural resources, where these industries balance supply and demand for agricultural crops, and that is done through surplus production of fresh consumption, in addition to providing the supply of preserved products throughout the year. The research problem is although food manufacturing in Egypt has many features, such as the availability of raw materials and labor, but the loss is now considered one of the most important problems facing Egyptian vegetable and fruit crops, and the lack of intertwined relations between producers and food manufacturing, in addition to the distance between them led to increase in losses and weakness of food manufacturing. While the aim of study to show the previous and current situation for the manufacture of vegetables, juices and syrups using chow's model and dummy variables to clarify whether there is a difference between the two study periods. The study used chow's model to show the difference in the quantity produced and consumed and per capita share of frozen vegetables, juices and syrups for the first period (1990-2004) and the second period (2005-2020). The study recommended that in view of the important role of food preservation in stabilizing prices throughout the year and raising the real value of food crops by converting them into suitable food products and reducing losses and increasing the added value, so attention should be given to the provision of food manufacturing alongside the specialized farms in production of perishable food crops of vegetables and fruits.

Keywords: The Food balance, the standard models, the produced quantities, the consumed quantities, the partial economic liberalization policies - the full economic liberalization policies.

1. Introduction

Agricultural industries are considered one of the important industries in countries with agricultural resources, where these industries balance supply and demand for agricultural crops, and that is done through surplus production of fresh consumption, in addition to providing the supply of preserved products throughout the year. It also reduces the losses of agricultural production, which helps to increase the income of the producer. Although the food manufacturing sector in Egypt has many features that help it grow, such as availability of raw materials needed for production of vegetable and animal raw materials, labor and capital especially after the support of government to the investors, and the existence of varied transportation network to transport goods and products to the markets. However, agricultural production is still depending on surplus of consumption of raw materials which is often not good for the quality specifications required for manufacturing, which affects the final product quality. This is in addition to rise the percent of losses of agricultural products which leads to wastage of agricultural resources, where the percent of losses sometimes reach about 60%, as well as the lack of intertwined relations between the agricultural production sector and manufacturing sector, this requires motivation of the farmers to produce the crops which is directed for the purpose of

Corresponding Author: Mahmoud Alaa Abdelazi, Department of Agricultural Economics, National Research Centre, Dokki, 12622, Giza, Egypt. E-mail:- alaafragfrg@yahoo.com

agricultural manufacturing , which requires directing producers in the right ways for packing, sorting and sending agricultural products to assembly centers that direct them to local market, manufacture or export them and make various operations on them.

The Problem of the Study

Although food manufacturing in Egypt has many features, such as availability of raw materials and labor, but the loss is considered one of the most important problems facing Egyptian vegetable and fruit crops, and the lack of intertwined relations between producers and food manufacturing, in addition to the distance between them led to increase in losses and weakness of food manufacturing.

Objective of the Study

To show the previous and current situation for the manufacture of vegetables, juices and syrups using chow's model and dummy variables to clarify whether there is a difference between the two study periods.

Data Sources and Research Method

The data was obtained from the Central Agency for Public Mobilization and Statistics, the annual bulletin to develop the movement of the production and available consumption is the most important industrial commodities. As for the research method, it was based on chow's model to find out the difference between the first (1990-2004) and the second (2005-2020) study period and also used dummy variable.

Test Model (F-Chow)
Model Description

The f-chow test is preformed to compare two periods to find out whether there's a real difference between periods or not. Another method may be used, which is dummy variables, and it's used to determine whether there are differences between periods or not, meaning that the difference is due to the intersection parameter, the regression parameter, or both together, the chow test is crystallized in estimating the sum of squares of deviations due to the residual (error) (SSE), and through which the F-Chow can be estimated, by performing the following steps:

1- The general trend line is estimated and then the regression coefficients for the first stage can be estimated from the outputs of (SSE1), and similarly (SSE2) for the second stage.
2- The general trend line is estimated in the two stages combined, considering that they are one stage, and from the model outputs, (SSET) can be estimated.
3- (SSE1) and (SSE2) are collected and their sum expresses in SSEU.
4- The difference between the two estimates SEET and SSEU is calculated as follows: D=SSET – SSEU.
5-The value of (F) calculated according to the Chow test is calculated as follows: D/K ___ F Chow = SSEU / (N-2K) where K = number of study variables, N = number of years.
6- The calculated (F) according to the Chow test is compared with its theoretical value from (F) tables at any level of significance with degrees of freedom [(k, (N-2K)]. The results are interpreted according to the standard (F) test.

Dummy Variables Method

To identify the source of the difference using dummy variables, the used model can be described as follow:

$$YT =a+b1T+b2D+b3TD \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots..(1)$$

Where YT = dependent variable T = independent variable (time) D = transitional variable by taking the value (0) for the first period and the value (1) for the second period.

$$TD =D* T\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots(2)$$

From this equation, the equation representing the first period can be derived as follows:

$$Yt1=a+b1T\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

And the equation representing the second period may also be derived as follows:

$$Yt2= (a=b2) + (b1+b3) T \quad or \quad Yt2=a +BT\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.\dots(5)$$

The chow model and the dummy variables model were used to obtain the value of (F) for the two periods that were divided, the first period (1990-2004, It's a period of partial liberalization of Egyptian agricultural policies, and the second period (2005-2020), the period of complete liberation of agricultural policies to determine the extent these policies are applied to the Production and trade of frozen vegetables, juices and syrups.

By studying the average produced and consumed quantity and the per capita share of frozen vegetables, juices and syrups for the first period (1990-2004) and the second period (2005-2020), it was found that the second period increased by about 83.7, 40.4, 0.361 for each of the produced and consumed quantity and per capita share of frozen vegetable, respectively, represents about 190.3%, 107.2%, and 60.4% respectively , while it was shown that the quantity produced and consumed and the per capita share of juices and syrups for the second period amounted to about 208.5, 172.7, 1.9, respectively. The increase for the second period is estimated at about 567.66%, 909.1%, and 909.1, 640.9, respectively. AS shown in table No. (1).

Table 1: The average of produced and consumed quantity and per capita share of frozen vegetables, juices and syrups for the first period (1990-2004) and the second period (2005-2020).

Statement	Frozen vegetables			Juices and drinks		
	Quantity produced (thousand tons	Consumed Quantity (Thousand Tons)	Per capita kg/year	Quantity produced (thousand tons	Consumed Quantity (Thousand Tons)	Per capita kg/year
First period (1990-2004)	44	37.7	0.598	36.7	19	0.3
Second period (2005-2020)	127.7	78.25	0.960	245.2	191.7	2.2
The difference between the two periods	83.7	40.4	0.361	208.5	172.7	1.9
% Increase between the two periods	190.3	107.2	60.4	567.66	909.1	640.9

Source: Central Agency for Public Mobilization and Statistics Annual bulletin of the development of the movement of production and available for consumption of the most important industrial commodities, different issues.

By studying the analysis of variance between the two periods (1990-2004) and (2005-2020) by using the (F-chow) test to show whether there is an impact of agricultural policies on the quantity produced, the consumer and the per capita share of frozen vegetables, juices and syrups. It appears that the calculated value of (F) is greater than the value of Tabular (F) for each of the produced quantity, consumed quantity, and per capita share of frozen vegetables, where the calculated value of (F) for each of the previous variables is amounted to 69.97, 24.05 and 9.09, respectively. This means that there is a real difference between the two periods for the impact of agricultural policies on the quantity produced and consumed and per capita share of Egyptian frozen vegetables, while the calculated value of (F) for the quantity produced and consumed and the per capita share is amounted to about 63.3, 38.7, and 81.15 respectively. This confirms the impact of policies on the previous variables, as shown in table No. (2).

It was found from the previous results of the model (F-chow) that there is a real difference between the two periods (1990-2004) (2005-2020) for each of the production, consumption and the per capita share of frozen vegetables, juices and syrups, and to obtain the increased value of the two periods, the dummy variables were used in which the value (0) for the first period and the value (1) for the second period were placed and the dependent variable is (Y) which is the value of each of the quantity produced and consumed and per capita. The independent variables are time (X), which is 31 years, then the dummy variable (d), which is (0) (1) and then multiplies the time by the dummy variable so that the resulting value is (dX) , thus, the equations in Table (3) are obtained.

Table 2: The steps for applying (F-chow) model to show the impact of policies on the quantity produced and consumed and the per capita share of frozen vegetables and juices for two periods (1990-2004) (2005-2020).

Statement	Quantity produced from frozen vegetables (thousand tons)	Amount of vegetables consumed frozen (thousand tons)	per capita frozen vegetables kg/year	The quantity produced from juices and sherbet (thousand tons)	Consumed quantity of juices and drinks thousand tons	One person's share of juices and drinks kg/year
SSEU1	7090.2	4899.7	0.930	3169.1	939.8893	0.156516
SSEU2	3066.8	1846.4	0.079	63167.4	70135.11	4.197621
SUM	10157.1	6746.2	1.009	66336.6	71075	4.354136
SSET	62802.6	18766.6	1.690	377534.9	275175.1	30.52783
d	52645.4	12020.4	0.680	311198.3	204100.1	26.1737
d/k	26322.7	6010.2	0.340	155599.1	102050	13.08685
n-2k	27	27	27	27	27	27
SSEU/n-2k	376.1	249.8	0.037	2456.913	2632.408	0.161
f	69.9	24.05	9.098	63.3	38.7	81.15
Statistical Significance	Significant	Significant	Significant	Significant	Significant	Significant

Source: Central Agency for Public Mobilization and Statistics Annual bulletin of the development of the movement of production and available for consumption of the most important industrial commodities, different numbers.

Table 3: Shows the equations for the quantity produced and consumed of frozen vegetables, juices and syrups using dummy variables for the two periods (1990-2004) (2005-2020).

Statement	a	B1x	B2D	B3Dx	R^2	F
Quantity produced from frozen vegetables (thousand tons)	3.74 (0.146)	5.03 (1.78)	53.4 (0.80)	(-2.02-0.5)	0.518	9.7
Amount of vegetables consumed frozen (thousand tons)	4.3 (0.226)	4.18 (2.0)*	19.18 (0.39)	-1.85 (-0.65)	0.37	5.3
Per capita frozen vegetables kg/year	0.137 (0.58)	0.05 (2.2)*	0.46 (0.75)	-0.04 (-1.20)	0.28	3.57
The quantity produced from juices and sherbet (thousand tons)	9.81 (0.48)	3.36 (1.5)	-84.87 (-1.61)	10.26 (3.40)**	0.91	96.
Consumed quantity of juices and drinks thousand tons)	4.34 (0.27)	1.83 (1.04)	-150. (-3.6)**	12.5 (5.27)**	0.93	116.1
One person's share of juices and drinks kg/year	0.110 (0.59)	0.023 (1.14)	-0.49 (-1.02)	0.087 (3.14)**	0.91	92.46

Source: Central Agency for Public Mobilization and Statistics Annual bulletin of the development of the movement of production and available for consumption of the most important industrial commodities, different numbers.

In order to obtain the value of the annual increase for the first period, which is referred to in the equation (B1x) and the second period which is the sum of (B1x) with (B3Dx), the amount of increase in the first period (1990-2004) can be obtained from Table No. (4), which amounts to about 5.03 thousand tons of frozen vegetables represents about 11.4% of the average period of 44 thousand tons. For the second period (2005-2020), the increase in the produced quantity of frozen vegetables is about 3.01 thousand tons, representing 10.9% of the average period of 127.7 thousand tons. As for the consumed quantity of frozen vegetables, it is estimated at about 4.18 thousand tons for frozen vegetables, representing about 11.1% of the average period of 37.7 thousand tons, while for the second period, the increase in the quantity of frozen vegetables consumed is about 2.33 thousand tons, representing 8.4% of the average period of 78.25 thousand tons. The amount of annual per capita for the first period was 0.05 kg/year of frozen vegetables, representing about 8.36% of the first period average of 0.598 kg/year, while for the second period the increase in frozen vegetables per capita is about 0.01 kg/year, representing 1.04% of the second period average of 0.690 kg/year, as shown in table No. (4).

From the above, it turns out that the decrease in the quantity produced of vegetables for the second period (2005-2020) is evident compared to the first period (1990-2004), where the first annual increase

was estimated at 11.4%, the first was about 11.4%. The consumed quantity for the first period amounted to about 11.1% and for the second period amounted to about 8.4%. Regards to the per capita, first period amounted to about 8.36% and the second amounted to about 1.04%, which means a tendency towards disinterest in the food manufacturing of Egyptian frozen vegetables.

As for the quantity produced of juices and syrups, the increase in the first period (1990-2004) amounted to about 3.36 thousand tons, representing about 9.2% of the average period of 3.36 thousand tons, while the increase in the quantity produced from juices and syrups in second period (2005-2020) is about 3.36 thousand tons, representing about 5.5% of the average period of 13.67 thousand tons. As for the quantity consumed of juices and syrups, in the first period, it is estimated at about 1.83 thousand tons, representing about 9.6% of the average period of 19 thousand tons, for the second period, the increase in the quantity consumed of juices and syrups is estimated at about 14.3 thousand tons, representing about 7.5% of the average period of 191.7 thousand tons. Regards to the per capita, the annual quantity per capita for the first period amounted to 0.023 kg/year of juices and syrups, representing about 7.7% of the average period of 0.3 kg/year, while the second period the increase in the amount of juices and syrups per capita is about 0.112 kg/year, representing about 5.1% of the average of the second period of 2.2 kg/year, as shown in table No. (4).

Table 4: The estimated annual change and the percentage of increase in the average quantity produced and consumed for frozen vegetables, juices and syrups for the two study periods.

Statement	Average period	Amount of annual increase		% Amount of annual increase from the average	
		The Second period	The First period	The second period	The first period
Quantity produced from frozen vegetables (thousand tons)	44				
Amount of vegetables consumed frozen (thousand tons)	127.7	3.01	5.03	10.9	11.4
per capita frozen vegetables kg/year	37.7				
The quantity produced from juices and sherbet (thousand tons)	78.25	2.33	4.18	8.4	11.1
Consumed quantity of juices and drinks thousand tons)	0.598 0.960	0.01	0.05	1.04	8.361
quantity produced from frozen vegetables (thousand tons)					
Amount of vegetables consumed frozen (thousand tons)	36.7 245.2	13.6	3.36	5.5	9.2
per capita frozen vegetables kg/year	19	14.36	1.83		
The quantity produced from juices and sherbet (thousand tons)	191.7			4.3	9.6
Consumed quantity of juices and drinks thousand tons)	0.3 2.2	0.112	0.023	5.1	7.7

Source: Central Agency for Public Mobilization and Statistics Annual bulletin of the development of the movement of production and available for consumption of the most important industrial commodities, different numbers.

It turns out from the above that there is an annual increase in the quantity produced and consumed of juices and syrups for the second period compared to the first period, as it appears that the quantity produced from juices and syrups for the first period (1990-2004) is about 9.2% , while in the second period (2005-2020), the increase was estimated about 13.6%, while the increase in the first period was about 9.6% for the quantity consumed, and the increase for the second period was about 14.3%. As for the per capita, the quantity of juice and syrups for the first period was estimated about 7.7%, while in the second period was estimated about 5.1%. Which means a trend towards an interest in food manufacturing for juices and drinks, but the shortage with regard to the per capita is a result of the continuous increase of population that affects what concerns the Egyptian individual.

The study recommended that in view of the important role of food preservation in stabilizing prices throughout the year and raising the real value of food crops by converting them into suitable food products and reducing losses and increasing the added value, so attention should be given to the provision of food manufacturing alongside the specialized farms in production of perishable food crops of vegetables and fruits.

Conclusion

The study recommended that in view of the important role of food preservation in stabilizing prices throughout the year and raising the real value of food crops by converting them into suitable food products and reducing losses and increasing the added value, so attention should be given to the provision of food manufacturing alongside the specialized farms in production of perishable food crops of vegetables and fruits.

References

Dalia S.A., 2013. An economic study of the potential of agricultural manufacturing in Fayoum Governorate, P.H.D. Department of Agricultural Economics, Faculty of Agriculture, Fayoum University.

Mahmoud K.A., 2021. An economic analysis of the food industry sector in Egypt, Master. Department of Agricultural Economics Faculty of Agriculture Damietta University.

Mohamed A.S., 2010. Economic study of the food preservation industry in the Arab Republic of Egypt, Egyptian Journal of Agricultural Economics, 25(4).

Mahomud M.A. *et al.,* 2015. Study of the Current and Future Situation of Certain Food Industries in Egypt, Egyptian Journal of Agricultural Economy, 20(4).

Momtaz N.M., 2006. Determinants of Foreign Demand for Egyptian Exports of Some Processed Vegetables and Fruits, P.H.D. Department of Agricultural Economics Faculty of Agriculture Ain Shams University.

Nagwa M.E., 1991. Economics of the Manufacture of Some Vegetable Crops," P.H.D. Department of Agricultural Economics, Faculty of Agriculture, Suez Canal University.

Yehia M.M., 2020. Estimation of Standard Models Using Computer, Egyptian National Library.