White Meat Economy in Egypt: An Econometric Framework

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Introduction

The present study intends to identify and quantify major factors affecting production, imports, and consumption of white meat in Egypt. Due to sever data limitation and inaccuracy, the econometric analysis presented in this study is simple. Given the complixty of the poultry sector in Egypt, the equations specified and statiscally estimated to represent the existing interrelationships in this sector seem to be reasonable inspite of its simplicity.

The Egyptian agriculture is characterised by complexity and high interrelationships between crop and livestock activities. Livestock in Egypt provides draft power to agriculture, as well as over 25% of the gross value of agricultural output. Red meat production in Egyptis mainly from cattle and buffalos. Sheeps and goats are of less importance, while camel meat and pork contribute minimally to total red meat production. White meat production consists of two categories, namely, domestic poultry strains and broiler industrial production-public and private sector. The present study deals only with white meat subsector.

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All current government policies related to the meat sector seem to have short run goals. These policies aim at achieving stable local meat prices and an implicit long run goal of reaching self sufficiency in meat.

Also, these policies aiming at encouraging poultry business seem to be based on the assumptions that white meat production has lower cost and higher capital use efficiency than red meat business. Thus, understanding the existing interrelationships for white meat production is of crucial importance for planning and policy implication purposes.

White meat consumption in Egypt has been increasing at an average annual rate of about 3.5% during the 1964-1979 period.

It reached over 160,000 M.T. in 1980. About 18% of this quantity were imported. The U.S. is the major supplier of frozen poultry to Egypt. Actually, all imports from 1974 to 1978 were from the U.S. (9). Government pricing and distribution policies affect greatly the growth and performance of this sector. Some chicken are sold through government owned stores at L.E. 0.96 per kilo. About 85% of the General Poultry Company's production is sold to state stores for distribution at this price. The rest is sold for Airlines and other specific markets at a little higher price of about L.E. 1.25 per kilo. Also, imported frozen chicken are sold

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(1) Numbers in parenthesis refer to the references number listed at the end of the study

for L.E. 1.05 per kilo at government-owned stores.

Village flocks and the newly developed poultry industry
of Egypt are in state of rapid change. The government-owned
General poultry Company was the only Supplier of baby chicks

It usually raises 20-25 million broilers and distributes
almost the same numbers to the private sector. In 1980,
three private companies started to have breeding operations
and provided chicks and feed to local growers, in addition
to raising broilers. Also, there are about 2,700 private po-
ultry farms in Egypt, most of them with the capacity of 5,000
birds (9). However, over the 1970's there were times of great
shortages of chicks and feeds, and drastic seasonal fluctuat-
ons in farmgate prices. As a result, many growers have gone
out of business, either temporory or permanently (5).

The study contains four more parts. The first deals
with objectives and analytical procedures, the second and
third parts deal with dicussion of the white meat production
and imports equations, respectively. The fourth part discus-
ses white meat consumption, Finally, Summary and conclusion
presented,

Objectives and Analytical Procedures

The major objectives of this study is to identify and
quantify major factors affecting production, imports and consumption
of white meat. It is the first attempt to quantify the effect
of these variables using time series data.

The present study includes two major behavioral equations for white meat production (WMQ) and white meat imports (WMI). Total white meat consumption (WMC) is estimated through an identity equation using production and imports estimates. The behavioral equations are specified and statistically estimated, using ordinary Least Squares Method (8). Several equations were specified and Statistically estimated to explain variations in the white meat production and imports equations.

The equations reported in this study are the best among the alternative fits. They have the smallest standard errors and largest number of a priori expected signs of the regression coefficients. Also, the reported equations have highest R^2 (coefficient of multiple determination) among alternative fits.

The equations were fitted using yearly data for the 1964 - 1979 period. Actual data for the 1978 - 1979 period were used to test for the equations production power.

The presence of positive serial correlation among disturbance terms is tested using Durbin - Watson Statistics. R^2, S.E. (equations standard errors), F-statistics, D.W. (Durbin-Watson Statistics), and $\bar{Y}$ (the dependent variables average) are reported with each estimated equations. For each estimated equation a percentage error index showing the percentage of estimated to actual values is calculated to indicate for the accuracy of estimation between actual and estimated values. The actual and estimated values are presented in diagramatic form.

An attempt is made to estimate white meat demand function by using Ordinary Least Squares and Seemingly Unrelated estimates

(8). Several specifications are used. The first included retail prices for white meat and red meat (RPPU (L) and RPRM (L)), and per capita expenditure (Y(L)) in nominal values. The second included consumer price index (CPI(L)) as separate explanatory variable, with the previous indicated variables. The third included deflated prices and per capita expenditure. The dependent variable for these equations is the per capita white meat consumption. All variables are used in natural logarithmic form. The Seemingly Unrelated estimates is obtained through estimating demand functions for major food commodities in Egypt.

Due to data limitation and inaccuracy, results of these estimates are considered preliminary. Improvements in estimating demand functions for white meat in Egypt seem to be crucial. For example, Price and income elasticities for major food commodities are of great importance to policy making in the areas of pricing, income distribution, and welfare economics.

The present study used consumption identity equation rather than the discussed behavioral demand functions. The estimated demand functions are reported to represent an invitation for further improvements.

White Meat Production Relation

As indicated earlier, white meat production consists of two major categories, namely, the domestic poultry strains, and the broiler industry production. However, data on the

production of the first category is calculated using fixed coefficients and is subject to great value judgement. Broiler production has been very important in the last few years. Unfortunately, no accurate time series data are available on this sector , because it is mostly under private management. Therefore, it is difficult at this stage to get enough observations to quantify the response of each category in Egypt.

Eventhough, Some evidences show that the domestic strains category is still the major source of domestic supply. However, its relative importance in total production is decreasing over time. Table (1), shows that one day-old chicks of domestic strains produced in Egypt were more than 96% of total chicks produced. In 1980 its importance decreased to about 56%. Given that not all foreign strains are for broilers, (A small proportion of them for layers). It is yet clear that the broiler industry production share is increasing rapidly over time, particularly, if the lower death rate of broiler chicks of about 5% is taken to weight the expected total production in comparison with the high mortality of domestic strains of about 25% .

Due to extreme data limitation concerning poultry production in Egypt, a single equation for the annual total white

Table (1): Numbers of produced one day-old chicks in Egypt

(1964 - 1980)

(000 chicks)

Year	Domestic Strains		Crossbred Strains		Foriegn Strains		total ; chicks	
	Number	%	Number	%	Number	%	Number	%
1964	80432	96.4	66	.2	2966	3.5	83464	100
1970	97664	89.5	57	.05	11428	10.45	109149	100
1975	100963	76.72	30	.02	30601	23.26	131594	100
1980	98968	55.7	667	.4	78085	43.9	177720	100

Source : (7)

meat domestic production (WMQ (L)) is specified and statistically estimated. the following equation had the smallest standard error among all alternative fitted equations.

$$WMQ (L) = 70.8566 + 1.707\ T (L) + 0.544\ CCL (L)$$
$$(4.772) \qquad\qquad (4.562)$$
$$+ 2.8\ 84 \qquad RIPR (L-1) - - - - - - - (1)$$

$R2 = 0.982 \qquad S.E. = 1.90 \qquad F = 184.308 \qquad D.W = 2.95$

$Y = 122.33$

The equation fits well with a standard error of 1.900 M.T, representing about 2% only of the average production during the sample period. the time trend variable (T (L)) was included in this equation to represent the rapid growth experienced in the broiler industry. The higher the corn available for livestock feeding (CCL (L)) the higher is white meat production. Also, the one year lagged price ratio of the retail price of poultry, RPPU, to the average value per unit of white meat imports, AVWMI, table (2),

has a priori expected sigh. The higher the domestic retail price relative to imports price, the more is white meat production in Egypt . While calculated percentage error indexes (% E I) are presented in table 3. Figure I indicates that the estimated equation seems to capture most of the turning points of production changes during the 1964 -1979 period.

Table (2): Values of the Explanatory Variables for the
1964-1979 Period.

Year	Corn available for livestock feeding (CCL)	Corn Imports (CI)	Retail prices for domestic chickens (RPPU)	Average Value of White meat imports (AVWMI)	Retail to Imports Price Ratio (RIPR)
	1000 M.T	1000 M.T.	P.T/kg	P.T./kg	-
1964	57	220	25.5	32.2	0.79
1965	58	138	45.7	27.5	1.56
1966	62	113	47.5	32.5	1.46
1967	60	269	41.4	34.1	1.21
1968	58	15	37.0	30.3	1.22
1969	57	64	43.3	26.5	1.63
1970	57	76	47.6	22.6	2.11
1971	56	48	49.5	22.2	2.23
1972	58	68	53.1	23.3	2.28
1973	58	67	55.7	25.0	2.23
1974	68	388	64.5	30.7	2.10
1975	72	418	75.3	40.0	1.88
1976	76	549	92.2	56.4	1.63
1977	85	591	104.8	47.2	2.22
1978	81	730	115.1	65.9	1.74
1979	85	494	120.5	89.7	1.34

Source : (1,2,6)

Table (2) : Actual, Estimated, and Percentage Error Index for Wheat (WMO) Production, Imports, and Consumption during the 1964-1979 period.

(000 M.T.)

Year	Production			Imports		Consumption		
	Actual (WMO)	Estimated	Error Index (1) %	Estimated	Error Index %	Actual (2) (WRC)	Estimated	Error Index %
1964	104.2	104	100	0.6	24	106.5	104.6	102
1965	107.9	108	100	1.9	61	111.0	109.9	101
1966	113.9	112	98	1.8	378	116.4	113.8	101
1967	109.1	112	103	0.0	---	109.2	112.4	97
1968	113.9	112	98	0.9	---	113.9	112.9	103
1969	116.4	117	100	0.1	---	116.4	117.1	99
1970	118.8	120	101	2.1	367	119.4	122.1	98
1971	124.8	121	97	2.7	78	128.3	123.7	104
1972	123.6	124	101	2.6	53	128.3	127.0	101
1973	123.6	126	102	2.6	107	126.0	128.6	98
1974	133.3	133	100	2.1	180	134.3	135.1	100
1975	137.0	136	99	4.0	133	140.0	140.0	100
1976	139.4	139	100	2.3	126	139.0	141.3	99
1977	146.7	146	101	4.7	179	152.6	150.5	101
1978	225.0	147	153	8.5	477	233.5	151.77	154
1979	261.0	150	175	19.3		280.3	153.55	183

(1) % Error Index = (Estimated ÷ Actual) X 100
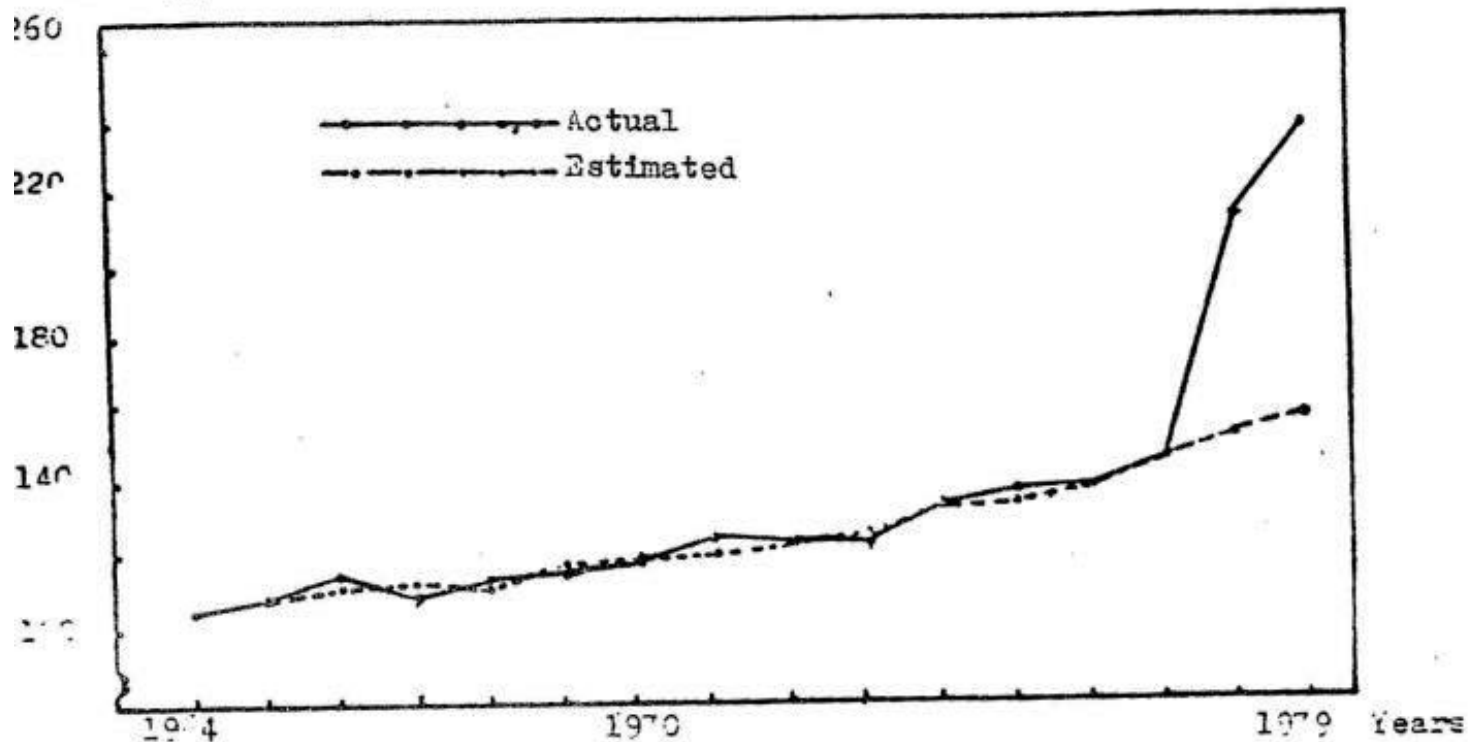
(2) Production plus Imports.

Source : (1 , 6)

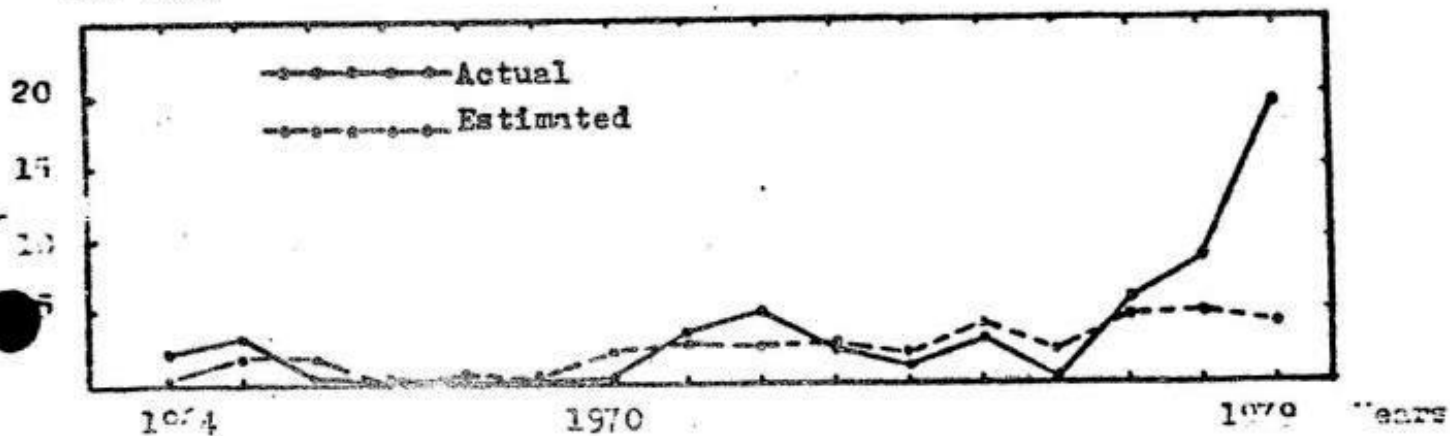Figure (1) : Actual and Estimated White Meat Production (1964-1979)

Figure (2) : Actual, and Estimated White Meat Imports 1964-1979

Egypt imports small amounts of frozen poultry and by-products (liver) . The yearly imports of meat , WMI (L) , fluctuated greatly , during the 1964-1979 period. Previous year's corn imports quantity, (CI(L -1)) and average value of white meat imports, (AVWMI (L-1), are used as explanatory variables to explain variations in white meat imports. Also , the domestic-imports price ratio (RIPR(L)) is used as another explanatory variable, in the equation to reflect the impact of relative increase in local market price on the white meat imports. It is of special interest since the private sector plays a significant role in this improtation decison more than in red meat imports.

Several alternative fits included white meat prduction were disregarded because of unreasonablly high standard error and a priori unexpected signs for estimated regression coeff-icients. This provides evidence that there is no consistancy between domestic prcduction and imports policies as reflected through published data.

The estimated equation to explain variations in white meat imports is as follows:

$$WMI(L) = -3.7664 + 0.0085 \; CI(L-I)$$
$$(1.84)$$

$$-0.0361 \; AVWMI(L-1) + 2.9714 \; RIPR(L) \ldots (2)$$
$$(0.49) \qquad\qquad (3.09)$$

$R^2 = 0.531$ S.E. = 1.51   F = 3.77   D.W. = 1.66

$\overline{Y} = 1.961$

The equation does not fit well and have high standard error. However, it seems to capture most of the turning points as indicated in figrue 2. The estimated equation provides additional evidence that white meat imports policy does not coincide with either local or international market signals. It seems that white meat imports decisions are made yearly or seasonally as a reaction to instant shortage in meat supply.

The positive sign of imported corn coefficient, though highly significant, shows that the government may not view feed imports policy as substitute for meat imports. It seems that the government follows both policies. The exporter market seems to enjoy benefit from both local merkets for the final product and input market.

The estimated regression coefficient for the imports prices has a priori expected negative sign. The elasticity estimated from this parameter approached-0.57. This estimates indicates that a 10% increase in the value of imported white meat would result in 5% decrease in imported quantities, However, this estimate should be discussed with caution since the estimated parameter proved to be statistically insignificant at 0.05 level of signicance. This may also indicate inconsistancy in local policies. However, the highly siginficant relation of a priori expected positive sign between domestic-imports price ratio and white meat imports quantities may reflect the private sector importers decision. The private importer takes the advantage of

higher local market price with respect to imports price. this happens even if the later is increasing.

White Meat Consumption

The total consumption of white meat, WMC (L), is calculated in this study using an identity equation as follows:

$$WMC \ (L) = WMQ \ (L) + WMI \ (L) \ \ldots\ldots\ldots \ (3)$$

The actual, estimated and error indexes are shown in table 2. the errors in the two previously estimated equations are reflected in the estimates obtained from this identity. Several fits were attempted to explain variations in white meat consumption through behavioral relations. Due to inconsistency and insignificance of estimated results, the identity equation is prefered at this stage.

Using time series data, several attempts were made using nominal prices and deflated prices. Also, Ordinary Least Squares and Seemingly Unrelated estimates methods were used in this regard. Table 4, indicates the estimated equations. The statistical insignificance of most of the estimated regression coefficients and the a priori unexpected sign for the income and white meat price variables could be a result of specification error . Data included in table 4 are preliminary in nature. Major improvements are required before elasticity measure canbe discussed. At this stage estimating white meat consumption through the previously discussed identity equation seem to be appropriate. The estimated Consumption levels are presented in table 3.

Table (4): Preliminary Least Squares and Seemingly Unrelated Estimates of White Meat Demand
Equations (1964-1979)

Estimation	Metod	Constant	ln RPRW	ln RPPU	ln Y	CPI	D.W.	R²
1	OLS	1.47 (9.8)	0.16 (1.23)	-0.14 (0.93)	-0.07 (1.4)		2.26	0.28
	SUR	1.51 (11.6)	0.21 (2.3)	-0.22 (1.8)	-0.06 (1.2)			
2	OLS	2.02 (3.1)	0.10 (0.7)	0.03 (0.1)	0.02 (0.3)	-0.25 (0.9)	2.59	0.33
	SUR	1.91 (0.63)	0.17 (1.3)	-0.07 (0.3)	-0.04 (0.6)	-0.19 (0.7)		
3	OLS	1.35 (12.8)	9.79 (0.6)	-2.85 (0.3)	-3.15 (0.5)		2.26	0.26
	SUR	1.15 (12.8)	11.64 (1.2)	-4.70 (0.5)	-3.11 (0.5)			

Using nominal prices and income.
" " " " , and consumer price index (CPI) as separate Explanatory Variable.
" deflated prices and income by CPI

Summary and Conclusion

The equations presented in this study can be improved greatly. Data Limitations govern to great extend the specification of the presented relations. However, the identified and statistically estimated relations for white meat production and imports seem useful in verifying some policy issues. It is a first step toward building a complete econometric model for the white meat economy in Egypt.

Corn available for Livestock and poultry feeding, the retail-imports price ratio for poultry, and a time trend reflecting the rapid growth in broiler technology, were the major explanatory variables explaining variations in white meat porduction. These variables explained about 98% of the variations in white meat production. The standard error of the estimated equation represented about 2% only of the average production during the 1964-1977 period. Actual and estimated values for 1978 and 1979 were compared using the percentage error index.

White meat imports fluctuate greatly. For example, published data indicate no imports in 1968 and 1969 and imports of about 100 M.T. in 1976, while it reached about 4,700 M.T. in 1977. The U.S. is the major supplier of frozen poultry. Privious year's corn imports, previous year's average value of white meat imports, and current retail-imports poultry price ratio are used as the major explanatory variables to explain variations in white

meat imports. These variable explained only 53% of imports variations. Since U.S. is the major supplier, the inclusion of variables reflecting the U.S. prices and aids through the PL-480 may improve the performance of this equation. However, the estimated relation provided useful evidence that white meat imports policy does not coincide with either local or international market signals. Also, the study concluded that imports decisions seem to be unrelated to variations in published production data. The production and imports policies seem to be inconsistent, and the study recognized the importance of private sector's importation for frozen poultry. Accordingly variations in the retail imports current pirce ratio was included in the imports equation.

Total consumption of white meat was estimated in this study through an identity equation utilizing the estimates from the previous equations. Attempts to estimate white meat consumption through behavioral relations were failed. Data limitations and multicollinearity among intended explanatory variables were among the major constraints to realize this objective.

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اطار قياسى تحليلى لقطاع اللحوم البيضاء
فى جمهورية مصر العربية

دكتور ابراهيم سليمان *   دكتور ضياء كمال عبده *

الملخــــص

تستهدف هذه الدراسة تقدير تأثير أهم العوامل المؤثر على انتـــاج
واستيراد واستهلاك اللحوم البيضاء فى جمهورية مصر العربية نظرا لعـــدم
توفر البيانات الكافية وعدم دقة البيانات المتاحة عن هذا القطاع فى مصـــر
فقد تم توصيف العلاقات القياسية فى هذه الدراسة بصورة مبسطة لتمثيل المرحلة
الاولى نحو توصيف وتقدير نموذج اقتصادى قياسى متكامل لهذا القطاع • ورغم
بساطة التوصيف المستخدم الآ انه أمكن التوصل الى عدة نتائج ذات دلالـــة
اقتصادية هامة بالنسبة لانتاج واستيراد اللحوم البيضاء •

وقد تم توصيف وتقدير معادلتين سلوكيتين لانتاج واستيراد اللحـــوم
البيضاء • وتم تقدير هذه العلاقات باستخدام بيانات السلاسل الزمنية للفتـــرة
١٩٦٤ - ١٩٧٩ • كما تم استخدام الطرق الاحصائية المناسبة لتقدير معالـم
المعادلات واختبار معنويتها الاحصائية • كذلك فقد تم توصيف معادلـــة
تعريفية لتقدير استهلاك اللحوم البيضاء كناتج للانتاج والواردات المقدرو • وجدى
بالذكر أنه قد اجريت عدة محاولات لتقدير الطلب الفردى للحوم البيضاء مـن
خلال معادلات سلوكية الا انه لم يتم التوصل لنتائج منطقية او معنوية نظـرا
لمشاكل متعلقة بدقة البيانات واتاحتها ما يؤثر على التوصيف للعلاقـــــات
القياسية • وفى هذا الصدد تم استخدام * طريقة المربعات الصغرى • كمـا
حاولت الدراسة حل معادلات الطلب للغذاء معا فى صورة معادلات تبدو غـــير
مترابطة * وذلك باستخدام الاسعار والدخل فى صورة جارية وصورة بالاسعـــا

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* استاذ مساعد بقسم الاقتصاد الزراعى - كلية الزراعة - جامعة الزقازيق •

الثابتة (بالقسمة على الارقام القياسية لاسعار التجزئة) كما تم استخدام الارقــام القياسية لاسعار التجزئة كعامل شارح بجانب عوامل الاسعار والدخل • ولقـــد اوضحت الدراسة عدم منطقية غالبية هذه التغيرات فى الطلب • وتعتبر هـــذه التقديرات دعوة للاهتمام بتقديرات الطلب والمرونات السعرية لاهميتها القصـــوى فى رسم السياسات السعرية وتوزيع الدخل واقتصاديات الرفاهية •

ولقد اتضح أن الكميات المستخدمة من الذرة الصفراء للانتاج الحيوانـى ، والنسبة السعرية بين سعر المستهلك ، ومتوسط قيمة الوحدة من واردات اللحـوم البيضاء ، ومتغير التطور الزمنى (عاكسا للتطور التكنولوجى فى صناعة الدواجن) تعتبر من اهم العوامل الشارحة للتغيرات فى انتاج اللحوم البيضاء • حيث تشرح هـــذه المتغيرات نحو ١٨٪ من التغيرات فى مستوى انتاج اللحوم البيضاء فى مصر • كما تم استخدام عدة متغيرات لشرح المتغيرات فى استيراد اللحوم البيضاء • وهـذه المتغيرات هى الاستيراد من الذرة فى العام الماضى ، ومتوسط قيمة الوحدة من واردات اللحوم فى العام الماضى ، والنسبة السعرية بين اسعار التجزئة واسعار الاستيراد فى العام الحالى • ولم تشرح تلك التغيرات الا نحو ٣٥٪ مــن التغيرات فى مستوى الواردات • ولقد اوضحت الدراسة أن الولايات المتحـــدة الامريكية تعتبر المورد الاول للحوم البيضاء الى مصر حيث مثلت واردات مصر من الولايات المتحدة نسبة عالية فى السنوات الاخيرة وكانت الولايات المتحدة الامريكية المورد الوحيد للدواجن المجمدة خلال الفترة ١٩٧٤–١٩٧٨ • ولذلك توصـــى الدراسة بضرورة التركيز على دراسة اقتصاديات الاستيراد من الولايات المتحـدة عند دراسة الواردات الكلية لمصر •

كما اوضحت الدراسة أن التحليل الاحصائى يشير الى احتمال عدم وجــود تناسق بين سياسات الانتاج وسياسات الاستيراد للحوم البيضاء فى مصر • كمـا يبدو أن قرار استيراد اللحوم البيضاء لا يرتبط بالمؤثرات الاقتصادية الماليـــة والمحلية بل يرتبط بتغطية النقص المؤقت فى الانتاج المحلى • ولقد اتضـــح أن العلاقات المقدرة تمثل اتجاهات التغير ونقط التحول فى كل من الانتــاج والاستيراد خلال فترة الدراســة •