



AN ECONOMIC ANALYSIS TO ESTIMATE FUNCTION OF INDIVIDUAL DEMAND FOR FISH IN IRAQ FOR THE PERIOD (1985- 2017)

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Abstract

Fish are an important for growth of human body. Demand for fish has increased in recent years due to high prices of competing beef, in addition to changing taste of consumers towards white meat like fish and poultry. Fish projects in Iraq suffer from many problems that negatively affected local production and its inability meet demand. This research aims to show demand for fish in Iraq during period (1985-2017) by estimating demand function in addition to knowing importance of its to Iraqi consumer by measuring price, income demand elasticity. Parameters of demand function were estimated, they are consistent with economic theory in addition to success in terms of statistical and standard tests through use of a double logarithmic formula. Results indicated through elasticity that demand for fish is relatively flexible, because elasticity of price is greater than one, and commodity is classified unnecessary for Iraqi consumer, because of income elasticity is greater than one as its consumption is limited to holidays only. As for cross-elastic relationship of fish with beef showed two commodities exchanged, while relationship of fish with poultry complemented. Study concludes that Iraq's production of fish is not sufficient to meet domestic demand, as it was noted that there are imports for different years in order to fill demand, which increases during occasions and weekly holidays. Study recommends developing fish wealth while maintaining a steady level of its prices by providing the necessary support to develop this industry.

Keywords : Demand function, Fish, Price of fish, Prices of meat

Introduction

Animal production is an essential aspect no less important than the plant side of the agricultural sector in meeting the food requirements of society. Fish is an important part of animal products in terms of food, industrial and commercial importance. Because of neglect, fish projects in Iraq suffer from problems and constraints of lack of good fodder, high costs of project production, poor financing and poor management, in addition to the low level of rivers, especially in the summer. These problems led to a decrease in the level of production and the inability to meet the domestic demand for consumption, which forces the country to resort to importing fish in addition to the high prices of the product in the local market. White meat in general, and especially fish, contain nutrients that are necessary for human life, such as proteins, carbohydrates, fats, and other nutrients, such as salts, as it is an important source for preparing the human body with iodine. Fish protein is one of the sources of animal protein important for building the human body. Health awareness also changed consumers' tastes of white meat as an alternative, as well as lower prices for red meat. All of these reasons led to an increase in domestic demand for fish in Iraq, although the consumption of fish in Iraq was not daily by individuals, but the demand for it increased on holidays, weekends and occasions, despite the increase in its prices in those periods, compared to the normal days when there is less demand for it. Demand for goods and services is one of the important topics in economic theory, which requires conducting many research and studies that address the problems of individual demand for various commodities as it represents the side and behavior of consumers as a result of changing commodity prices as well as the level of their income as well as diagnosing and knowing the economic importance of the commodity, whether necessary or usual or Poor. Also, studying demand is extremely important because it is closely related to the life and development of societies, as it represents the primary axis of market study, so it is the

study of the market that will produce demand for the product, and through it the production capacity of the project can be determined, and from the production capacity, technology, production methods and the size of the project can be chosen. Determine the production and sales plan on which the financial and economic analyzes of the project depend, and from it determines the profitability and return of the financial and economic project (Mutlak, and Hiyali 2010). The research aims to study the local demand for fish meat in Iraq during the time series period (1985-2017) through measuring and estimating the function of the local demand for the commodity as well as knowing the importance of the commodity to the Iraqi consumer by measuring the price and internal elasticity of the commodity studied during the study period. The topic is a large number of local and Arab studies in addition to foreign: (Saidi and others, 1990), (Mohammed, 2002), (Ahmed and Thalag, 2007), (Hussain and Ahmed, 2009), (Al-Husseini, 2012), (Jassim and Farhan, 2015) all of these studies have been concluded with regard to the demand function to the role of factors. Price and individual's income in influencing the required quantity of goods, and that the price elasticity was greater than the plates This indicates that the product is natural and necessary goods.

Materials and Methods

Demand for goods and services expresses a group of individuals who have needs that require satisfaction and money for spending and his desire to obtain goods and services. Consumer demand is defined as a group of consumers who are able and willing to make the purchase, and this definition allows the satisfaction of the need or desire, expressing the individual demand in different quantities that the individual is ready to buy from a specific commodity at different prices in a specific market and at a certain time, assuming that factors remain The other is fixed without change. As for the aggregate demand, it is the sum of the different quantities of a particular commodity by all

members of society who are able to purchase it at different price levels in a specific time period, while the other factors remain constant (Munsif and Sharafy, 2009) This research is an attempt to study the individual demand for fish meat in Iraq for the time series of the period 1985-2017. The main variables confirmed by the economic theory were used by the amount of annual per capita consumption of fish meat (dependent variable) and both the commodity price and the annual per capita income and the prices of alternative and competitive goods where two commodities of known meat were selected in the food of the Iraqi consumer which are the prices of red meat as well as the price of poultry meat for the purpose The comparison between them and the statement of either of them was an alternative or a competitor, as well as a time variable as independent variables, for the purpose of studying its effects on the required quantity of the commodity studied (Koutsoyiannis,1977).as well as estimating a mathematical model for individual demand for fish meat during the study period where r Mathematical modeling is as follows:

$$Q_d = f(X_1, X_2, X_{3t-1}, X_4, T)$$

Q_d : Average per capita annual fish consumption

X_1 : Fish price

X_2 : Consumer income

X_{3t-1} : Beef price

X_4 : Poultry price

T : Time

Consideration must be given when determining the form of the equation that the researcher chooses to be mathematically sound in determining it, and between the necessity for this equation to conform to economic concepts and theoretical assumptions that relate to a topic. The analysis was carried out using the calculator and using the statistical program (SPSS17) and adopting the standard economics method known as Ordinary least squares method (OLS) method. Four functional variations of the model (linear and double logarithmic, half logarithmic and half reverse logarithmic) and selection of the best formulas to represent the studied relationship were estimated based on the criteria of economic, statistical and standard theory.

Results and Discussion

The reality of fish production and consumption in Iraq

Fish are considered an important food commodity for the human body due to the high amount of animal protein, as

well as salts and minerals, especially the iodine component that the human body needs. Fish need an appropriate water environment for their breeding and production. Although Iraq has the Tigris and Euphrates rivers as well as the Shatt al-Arab outlet on the Gulf in southern Iraq, local production has not reached the level required to meet consumers needs due to less production projects, a lower level of production and increased over fishing as limited Shatt al-Arab port worked on oil export ports and commercial ships. Table (1) shows the development of domestic production and consumption of chicken meat for the period (1985-2017). Local production in Iraq was characterized by fluctuation, reaching 48 thousand tons during 1985 and continued to decrease and fluctuation until it reached its lowest level during 1991, reaching 18 thousand tons. The reasons for the decrease in production are due to the decrease in the amount of river water, especially in the hot summer season, which leads to the evaporation of water, as well as the political and economic conditions that passed through the country during that period. Then production increased by a few percentages to reach the highest amount during the studied period, reaching 110.5 thousand tons during the year 2013 due to the expansion of projects and the increase in their production, but again production returned to decline and fluctuation until it reached 63.3 thousand tons during 2017.

Available quantities of consumption of fish meat at the country level and during the study period, you can see a table (1) The amount available for consumption consists of the total domestic production with the quantities of imports as the consumption quantities indicate a fluctuation in their levels during the study years, so the lowest level of local consumption is 22.42 Thousand tons during 1991, while the highest amount of consumption during 2013 was 156.3 thousand tons. The table also indicates the quantities of the average per capita consumption of fish meat in Iraq during the study period, which was calculated by dividing the total consumption by the amount of the population size during that year where this variable represents the amount of the quantity required annually by consumers over fish meat. These quantities were fluctuated in quantities during the years, as they did not exceed in their quantities 3 kg and not less than 1 kg annually.

Table 1 : Production, Imports, Available for Consumption and Average per capita Fish in Iraq for the period (1985-2017)

Years	Production 000(ton) 1	Import 000ton 2	Consumption 000ton 1+2=3	Population Million 4	Per capita fish meat kg 3/4
1985	48	0	48	15.59	3.079
1986	40	1.46	41.46	16.11	2.574
1987	20	0	38	16.34	2.326
1988	26	0	30	16.88	1.777
1989	23	0	28	17.43	1.606
1990	31.5	79.56	55	17.89	3.074
1991	18	4.42	22.42	18.42	1.217
1992	21.6	4.35	25.95	18.95	1.369
1993	24.5	7.67	32.17	19.48	1.651
1994	25.6	0.6	26.2	20.01	1.309
1995	33.4	1.59	34.99	20.54	1.704
1996	35.1	5.25	40.35	21.12	1.911
1997	37	4.82	41.82	22.05	1.897

1998	27.7	3.25	30.95	22.7	1.363
1999	30.4	2.32	32.72	23.38	1.399
2000	28	6.44	34.44	24.09	1.430
2001	26	4.7	30.7	24.81	1.237
2002	45.5	0.13	45.63	25.57	1.785
2003	21	7.2	28.2	26.34	1.071
2004	18.4	10.5	28.9	27.14	1.065
2005	34.7	0	34.7	27.96	1.241
2006	56.8	0	56.8	28.81	1.972
2007	54.4	2.1	56.5	29.68	1.904
2008	47.9	18.19	66.09	31.89	2.072
2009	53	21.74	74.74	31.66	2.361
2010	55.9	45.83	101.73	32.49	3.131
2011	48.8	32.87	81.67	33.34	2.450
2012	67.9	61.61	129.51	34.21	3.786
2013	110.5	45.8	156.3	35.1	4.453
2014	84	46.76	130.76	36.01	3.631
2015	46.3	51.39	97.69	35.21	2.774
2016	55.9	47.98	103.88	36.17	2.872
2017	63.3	48.71	112.01	37.14	3.016

Source: Ministry of Planning - Central Statistical Organization

The data in Table (2) indicate the evolution of meat prices (fish, poultry, and beef) in Iraq during the study period. In general, we can see that these prices tend to increase continuously during the period, due to inflation and the decrease in the value of the local currency, especially during the 1990s, when the local currency amount deteriorated, which led to the continuous rise in the prices of all goods and services. It can also say that the increase in

prices Meat was not reflected in the quantities of production positively, but rather led to a decrease in the level of production for the various animal products in Iraq, especially fish. In addition to the high prices of production inputs such as fodder and veterinary medicines, all of this led to a deficiency in production and consequently a decrease in domestic supply for that commodity.

Table 2 : Prices of meat in Iraq for the period (1985-2017) (dinars / kg)

Years	Price of fish	Price of Poultry	Price of beef
1985	3.6	1.28	3.14
1986	4.5	1.32	3.03
1987	5.4	1.44	3.69
1988	6.6	1.78	4.94
1989	4.6	2.24	5.1
1990	7.6	3.25	7.73
1991	12	10.68	11.7
1992	32	22.23	28.22
1993	75	66.16	77.43
1994	301	347	337
1995	2400	1440	1305
1996	1193	1826	1398
1997	1515	1825	2040
1998	1949	1938	2588
1999	2055	1602	2462
2000	2200	1468	2100
2001	2068	1447	2623
2002	2108	1531	3122
2003	2125	1525	4125
2004	2250	2222	5293
2005	2255	3100	6128
2006	2500	4040	7895
2007	3000	3663	8008
2008	3860	4540	9000
2009	4700	5000	12650
2010	6560	4688	14375
2011	6955	3583	15125
2012	7640	3875	15750
2013	7350	3560	15250

2014	7034	3425	15000
2015	6923	3566	14500
2016	6139	3450	14200
2017	4996	3500	14000

Source: Ministry of Planning - Central Statistical Organization

Table 3 shows the evolution of national income at current prices and the average per capita share calculated by dividing the total national income by the population during the year. The national income is considered one of the factors affecting the consumer demand for fish meat through the influence of consumption on the level of the individual's income and the amount of his purchasing power through what is allocated from his income on that commodity. We

notice during the period that individual income is heading for a gradual increase, which indicates an improvement in the overall living situation of the Iraqi consumer and an increase in his purchasing power for goods and services, including fish. The level of individual income depends on the amount of national income that is characterized by the relative increase during the study period.

Table 3 : National Income, Population, and Average Per Capita National Income for the period (1985 - 2017)

Years	National income Million ID 1	Population Million 2	Per capita national income 000 ID/Year 1/2
1985	12686.7	15.59	52.19831
1986	12655.6	16.11	48.7275
1987	15311.3	16.34	57.34664
1988	16982.9	16.88	59.60284
1989	17866.9	17.43	57.2576
1990	20018.1	17.89	62.54638
1991	18744.6	18.42	55.21173
1992	49814.8	18.95	138.7203
1993	125277.3	19.48	330.1848
1994	626920.9	20.01	1565.967
1995	2020069.4	20.54	4789.046
1996	2278205.2	21.12	5106.487
1997	2929007.3	22.05	6026.984
1998	15013422.3	22.7	29133.3
1999	31381048.5	23.38	57403.89
2000	46634634.8	24.09	80372.44
2001	36726500.7	24.81	59658.65
2002	34677722.5	25.57	53048.61
2003	25728748.6	26.34	37084.05
2004	45923315.7	27.14	63704.35
2005	65798566.8	27.96	84158.01
2006	85431538.8	28.81	101573.7
2007	100271093.3	29.68	113819.7
2008	147641254	31.89	151406.4
2009	120429277.2	31.66	120128.5
2010	146453468.5	32.49	143440.9
2011	192237070.3	33.34	179088.8
2012	227221851.2	34.21	192309.3
2013	243518658.5	35.1	197659.6
2014	237554034.2	36.01	183196.1
2015	178908402.3	35.21	144310.8
2016	183609460.7	36.17	140345.4
2017	220905600	37.14	160148.5

Source: Ministry of Planning, Central Statistical Organization, annual statistical

Analyzing the function

When studying any relationship between several variables, that relationship should be set in the form of a mathematical equation to obtain a model through which to study the nature of the economic relationship in an applied manner. Also, it is necessary to know the prior theoretical expectations about the indication and the size of the estimated parameters, in order to evaluate the results of the

mathematical function from an economic and statistical point of view and to overcome all problems.

In order to estimate the demand function for fish meat in Iraq during the study period, the per capita consumption of fish meat was adopted as a dependent variable, the effects of fish prices, red meat prices, chicken meat prices, and consumer income represented by per capita income from the national income, as well as the use of time variable all are independent factors for the purpose of disclosure. The effects

of prices on domestic demand for fish meat for the studied period (1985-2017). A statistical analysis of the studied data was performed and then results were obtained. The double logarithmic model is considered one of the best models for the function of fish demand. The previous variables will be expressed The following symbols:

$$\ln Q_d = -0.816 - 0.354 \ln X_1 + 0.414 \ln X_2 + 0.182 \ln X_{3,t-1} - 0.390 \ln X_4 + 0.043 T + U$$

t: (-2.739) (-7.448) (5.337) (1.861) (-5.203) (3.852)

R²=74.5% R =86.3% F=15.781 D.W=1.074

From the above results, we note that the functional model is significant according to the F test, which has a value of 15.781 at a 5% level of significance. The value of the determination coefficient was R² = 74.5%, which confirms that the above-mentioned independent variables that explain the explanatory power of these variables affected the domestic demand for fish, as it was able to explain a total of 74.5% of the changes in the dependent variable and that the random variable impacted the rest 24.5%. The values of parameters and signals the estimated demand function will explain the economic side of the statistical sequentially:

The fish price parameter (X1) of -0.354 indicates the inverse relationship between the price and the quantity required, so it was consistent with the logic of economic theory and the law of price demand, meaning that increasing the local price by 1% will lead to a relative decrease of -0.354 in the individual demand of the commodity, meaning that the change in The demand is less than the price change. The price can be considered one of the most important variables in the demand for goods, being the primary and important factor in the consumer's tendency to buy or not to buy that commodity. Also, the decrease in the price of the commodity will lead to an increase in the real income of the consumer, thus increasing the quantity purchased of the commodity.

The estimated parameter for consumer income (X2) was 0.414, which indicates the direct relationship, meaning the direct relationship between consumer income and the required quantity according to the economic logic, since increasing the consumer's income by one unit leads to an increase in the required quantity by 0.414 which is considered an increase less than the percentage of increase in income. The economic theory indicates that per capita income is an important impact in determining the demand for goods. The increase in real income positively affects the quantity demanded as a result of increasing the purchasing power of the individual.

On the parameters of the prices of alternative and competitive goods, the two closest alternatives to fish meat, namely chicken meat and red meat, were chosen for the

purpose of comparison between the three commodities in terms of prices. The estimated parameter for red meat prices (X3t-1) (for the previous year) was 0.182 (since increasing the price of red meat by one unit leads to an increase in the demand for fish meat by 0.182, i.e. the commodity of red meat is an alternative to fish meat. For the price of chicken meat (X4) at -0.390 that is, the relationship is inverse. The increase in the price of chicken meat leads to a decrease in the demand for fish meat. This means that they are two complementary commodities for the Iraqi consumer, as this depends on economic theory, so the positive relationship between the quantities required of a commodity and the prices of commodities Alternative and to the negative relationship with the exponent R complementary goods. This also explains the tastes of meat consumption in Iraq, the Iraqi Consumers prefer to eat meat either white or red meat during the meal and not be confused with all of them.

The time parameter (T) recorded a positive value of 0.043, as its effect was significant in the model.

Standard demand function tests

Regarding the model passing the standard problems, it can be clarified depending on the value of the test (DW). It is clear from the average test that the model is devoid of the problem of self-correlation between random variables. :

$$du \cdot 1.074 < 4-du$$

$$1.041 < 1.074 < 4-1.041$$

$$1.041 < 1.074 < 2.959$$

As for the double linear correlation, and through the availability of many tests that many studies are accustomed to, the most famous of which is the Klein test, through which the model was able to overcome this problem because the linear correlation problem exists only if there is a linear relationship between the independent variables, and since the relationship is nonlinear, this problem Do not show that the model is logarithmic, so it does not suffer from this problem. Since the data adopted in the research are time series data as well as the logarithmic model, it reduces the chances of the appearance of the heterogeneity of the error variance that appears in the sectional data more than the time series data.

Calculation of Elasticity

After studying the demand function and clarifying the effect of the factors mathematically affected by it through the logarithmic functional relationship, we will look at measuring the various demand elasticity of price, internal and cross-section to find out the relative effects of the factors affecting the required quantity. For the consumer, it is considered complementary to the study of the demand function of any commodity, as shown in Table 4.

Table 4 : Types of elasticity calculated from the demand function for fish .

Type of Elasticity	Values	Importance of commodity
Price elasticity	-1.066	Flexible demand
income elasticity	1.774	Unnecessary commodity
Cross elasticity (with Beef)	0.581	Substitutes goods
Cross elasticity (with poultry)	-1.108	complementary goods

Source: Calculated based on previous results in the estimated demand function

From the previous table, the value of the elasticity factor of the price demand was (-1.066), as it indicates that the demand for fish is flexible, because the value of elasticity is greater than the correct one, and the negative sign indicates the inverse relationship between the price and the required quantity, and means that the change in the price of fish by 1% will To an adverse change in the required quantity of fish meat by (- 1.066). The internal demand elasticity of 1.774 indicates that this parameter refers to classifying the fish meat as an unnecessary commodity, because the value of the elasticity coefficient is greater than one. Iraqi fish meat is considered an unnecessary commodity and its consumption is limited only on occasions and holidays as it is necessary in it and not on a daily basis like other meat. Elasticity of cross-demand, it has been calculated for two red meat commodities as well as chicken meat, as for cross-demand elasticity with red meat it reached 0.581 It was positive for any two substitutes, i.e., the increase in the price of beef would lead to an increase in the required quantity of fish. As for the elasticity of the cross-demand with chicken meat, it amounted to (1.108) from fish.

It could conclude through the above study that Iraq's production of fish meat is not sufficient to meet the needs of local demand, as it is observed that there are quantities of imports for different years, in order to meet the need for local demand of fish meat, especially during occasions and weekly holidays, where the demand for it increases significantly more than the rest Other days. Flexibility is greater than one, which explains the consumer's great response to change because the increase in quantity is greater than the decrease in prices, and despite the continuous increase in prices during the study period, it does not reduce the required quantity, which indicates that the quantity is affected by other factors, how we noted previously that consumers of fish meat prefer Consumed during holidays and family events more than normal days as a diet. The research recommends the necessity of developing the animal wealth, especially the fish wealth in exchange for the demand for it and the consumption of its products. It should always be in favor of developing this wealth and maintaining a steady level of their prices towards the desires of consumers in order to increase their purchasing power and develop fish projects by providing the necessary support to develop this industry in the long run. Serving for future generations, as well as setting scientific plans through research and studies in the field of breeding and improving fish species in order to increase production and achieve self-sufficiency and reduce imports, it is also necessary to provide support services for the product Yen, such as extension, transportation, marketing and warehousing, which works alongside increased and development the production.

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