A QUANTITATIVE ANALYSIS OF DEMAND FOR FISH IN NIGERIA

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ABSTRACT

The paper discusses the relevant theoretical considerations and specifies a
model in an attempt to quantify those variables, the changes of which, affect
the internal demand for fish in Nigeria. Regression analyses carried out show
that a generally rising trend in per capita income will increase the demand for
fish, other things being equal. It is further revealed that even as the price
of fish goes on increasing, consumers' demand for fish also tend to rise. The
paper concludes by emphasising the need for a fish consumption survey in the
country's fish demand.

INTRODUCTION

The study of the economics of fish demand and consumption is worthwhile not
only in determining national (and localised) fish requirements but, in the
final analysis, in satisfying public demand for fish products. The major
objective of the present study is to underline the importance of changes in
consumers' choice with respect to fish in Nigeria.

Fish is important not only for its calorific value but also as an important
source of animal protein. Moreover, thousands of the Nigerian populace derive
their livelihood directly from activities related to fish procurement,
distribution and consumption.

The objectives of this study are two-fold. In the first instance, the paper
seeks to quantify those variables, the changes in which, affect the internal
demand for fish in Nigeria. On the basis of the analysis, this study also
points out the implications of changes in the demand for fish particularly
highlighting the difference between the amount of fish consumed and the amount
demanded.

The paper is divided into four sections. In section II, theoretical considerations
germane on the topic under investigation, are discussed while specifying the model
for analysis. Section III gives the results and the economic interpretation of our
analysis. In the last section, the summary and conclusion of the study are
presented.

METHODOLOGY

Theoretical Considerations

In theoretical economics, a demand curve is supposed to be drawn under very
strict conditions for given tastes, incomes, prices of related goods and a
generally fixed environment. Under this formulation, quantity demanded is
assumed to depend linearly on price P_t, consumer income y_t, price of related
good $p't$, changes in consumer tastes z_t, and the disturbance term u_t.

The demand for food in Nigeria is increasing rapidly. This is to be expected
since economic growth gives rise to a number of forces leading to a rapid
increase in demand for consumable items such as food. One such food items
is fish.

Thus,

$$qt^d = \&o + \& pt + \&_2 yt + \&_3 p't + \&_4 zt + ut.$$

In some cases, the inherent curvature of an economic relationship can be displayed in a non-linear function which can be transformed into a linear function. Such functions including the logarithmic and exponential are widely used in econometrics because they lend themselves readily to transformation into linear functions, a convenient property.

Demand functions of the constant elasticity type, can be written as

$$x_{it} = A_i \frac{(P_1 t)}{(P_t)} a_{1i} \frac{(P_2 t)}{P_t} a_{2i} \ldots\ldots \frac{(P_{nt})}{P_t} \&ni \frac{(yt)}{P_t} Bi \, U_{it}$$

If logarithms are formed on both sides, the equation is transformed into

$$\log xit = \log A_i + \&_{1i} \log \frac{P_{1t}}{P_t} + \&_{2i} \log \frac{P_{2t}}{P_t} + \ldots + \&_{ni} \log \frac{P_{nt}}{P_t}$$

$$+ B_i \log \frac{yt}{P_t} + \log u_{1t}$$

If this equation were expressed in absolute instead of relative prices and money instead of real income, the homogeneity property could be brought out as Klein (1962) has pointed out. This is done by setting the sum of all the exponential parameters to zero.

$$x_{it} = A_{p1t} \&1i \, P_{2t} \&2i \ldots\ldots P_{nt} \, P_t \&i \, y_t \, B \, u_{it}$$

where $\sum_{j=1}^{n} \&_{ji} + B_i + \&_i = 0$

Believing as he does, that in agricultural markets, errors enter multiplicatively, Fox (1955) adopts a similar approach. He uses structural models composed of equations linear in the logs of all exogenous variables. An approach such as this has the advantage of producing direct estimates of the elasticity of demand.

In empirical studies of the market for various meats in the United States, Fox presents evidence that in any year, both domestic production and domestic consumption result mainly from prior decisions. In some of his equations, he estimates all coefficients from logarithmic first differences of original data, that is he employs:

$$q = \log \frac{Qt}{Q_{t-1}} \text{ rather than } q = \frac{Q_t}{Q}$$

A case can be put up for this, since in time-series regressions, the use of logarithmic first difference tends to reduce multicollinearity (through eliminating the effect of common trends and cyclical influences). Also, such a transformation is more likely to keep extra sample experience within the range of previously observed tradition.

In estimating a demand function for beef in the United States between 1922 - 1941 using the indirect least squares

$$p = B_{1q} + B_{2y} + B_{3w} + y_d$$

where

p = rental market price,

q = quantity demand,

y = consumer disposable income (per capita),

w = weather,

v = disturbance terms,

B_1, B_2 and B_3 = coefficients.

Fox obtained results which differed from corresponding single-equation estimates (based on logarithmic first differences) by no more than one standard error.

Any attempt to test these relations of economic theory in developing countries, is fraught with problems. The most pressing and immediate obstacle is a lack of suitable data. There are errors in reporting, compilation and publication of data collected by government agencies. Besides, the data record phenomena of the market (aggregates of specific kinds of transactions) whereas the theory deals with phenomena of the mind.

While conceding that situations of inadequate and often unreliable data existent in developing countries make studies on demand analysis a hazardous task, efforts still need to be made to make reasonable guestimates on the basis of rational assumptions as a first basis for planning.

Model Specification

In the present model, demand is expressed as

$$Q_{ft} = f(P_{ft}, P_{mt}, Y_t, T) \quad \dots\dots\dots\dots\dots\dots\dots \quad (1)$$

where

Q_{ft} = per capita demand for fish in Nigeria in time t,

P_{ft} = Retail price of fish in time t,

P_{mt} = Retail price of meat in time t,

Y_t = per capita income in Nigeria for year t,

T = time trend (year 1973 = 1, 1981 = 9).

In estimating the value for the dependent variable, Q_{ft}, sales figures were used as a proxy. The values obtained were checked for consistency with figures obtained from the Federal Department of Fisheries and the Federal Office of Statistics, Lagos.

As explanatory variables, the prices of fish and meat were obtained and averaged out for major consumption centres in the country. The figures so obtained, as well as yearly per capita consumer incomes, were deflated by the consumer price index for food products for the nine-year period considered, 1973 - 1981.

Each of the explanatory variables was assumed to be non-stochastic. The disturbance term, used below in equation 2, was assumed to be normally distributed.

Data Analysis Procedure:

Multiple regression analysis was used to estimate two different functional forms: the linear and the exponential with the latter linearised by the use of a log transformation.

The functional form providing 'best fit' was the exponential function (equation 2) while the estimating equation was the transformed form (equation 3).

$$Q_{ft} = a_o \, P_{ft} \, a_1 \, P_{mt} \, a_2 \, Y_t \, a_3 \, T \, E_t \quad \ldots\ldots\ldots\ldots \; (2)$$

$$\text{Log } Q_{ft} = a_o + a_1 \, \log P_{ft} + a_2 \log P_{mt} + a_3 \, \log Y_t + a_4 \, T + U_t \; \ldots \; (2)$$

where

Q_{ft}, P_{ft}, P_{mt}, Y_t are as previously defined.

a_o = Constant term.

a_1 - a_4 = Regression coefficients for explanatory variable used.

T = Time trend.

U_t = is $\log E_t$ and is assumed log normal.

ESTIMATION OF DEMAND

Taking estimates from selected equations, our investigation revealed the following, among other things:-

(i)   the inclusion of time as a significant explanatory variable,

(ii)   the inclusion of all types of fish in averaging out fish prices improved the 'fit' over the average price for three widely sold fish types (Mackerel, Skumbia and Staverda).

In selecting our equations, the values of the coefficient of multiple determination, the adjusted R^2, were used. The correctness of the form of equation was also weighed in practice against the ready understanding of the meaning of the coefficients.

Resultant equations are given in the table below. In interpreting the equations, it should be borne in mind that the model tested ignores a number of promising niceties; disposable income is taken as exogeneous no distinction is made between different types of meat; the demand and consumption patterns of fish and meat in the country as a whole are generalised.

TABLE	Selected Regression Results on the Demand for Fish in Nigeria							
Equation Number	Commodity	Dependent Variable	Constant term	Regression Coefficients of Explanatory Variables				R2
		$\log Q_{ft}$		$\log P_{ft}$	$\log P_{mt}$	$\log Y_t$	T	
4	All types of Fish		21.755	(6.110* (2.843)	−5.490 (4.948)	5.116 (4.889)		0.34
5	All types of Fish		−13.783	6.542* (2.716)	−13.433* (3.620)	13.117* (3.297)	0.660* (0.106)	0.83
6	Three Widely sold types of Fish		−2.420	4.008 (3.339)	−7.232* (2.820)	5.485* (2.744)	0.506* (0.147)	0.79

Notes:-

(i)   Figures in parenthesis are standard errors.

(ii)   The coefficeints astericked are significantly different
         from zero (at the 5 percent level of significance).

On the basis of our selection criterion equation 5 seems to be the best-fitting
equation. In that equation, the income coefficient, Y_t, is significantly different
from zero. This is to be expected as growth in per capita income tends to increase
quantity demanded of non-starchy foods especially in situations where previous
consumption has been below saturation level.

Like Y_t, the time trend, T, is also significant over the period considered, 1973
to 1981. As time want by, the amount of fish consumed increased due to the effect of
socio-economic and other factors.

In equation 5, as well as in other equations, the effect of the quantity of fish
demanded on meat prices, is demonstrated. Even though we have assumed away such
influences as consumer substitution between fish and various types of meat as the
prices of meat vary, it is apparent from the resultant equations that as the
quantity of fish demanded or purchased increases, the 'price of meat' declines.
This is especially so in situations where it is more favourable, economically or
otherwise, to consume fish.

Finally, our best-fitting equation shows the relationship between the quantity of
fish demanded and the price of fish to be positive. This seems contradictory to
a priori expectation as one would have expected an inverse relationship between
price and quantity demanded. The explanation for this is that in most developing
countries, quantity supplied often falls short of demand and the common assumption
that Q_c and P_c relate in an inverse manner may not always hold true.

This observation can be explained even by static economic theory as depicted
diagrammatically below.

Figure 1 - Diagramatic illustration of the relationship between the quantity
             of fish sold and fish price

At point A, as on points along the supply curve MN, inverse relationship between price and quantity holds, given that demand is fully satisfied. However, in situations where demand is far from being satisfied, and supply deficit NB exists, as occur in most developing countries, price keeps rising as demand increases (as long as quantity supplied is below quantity demanded).

If an observation of this sort occurs in a developed economy, however, a different explanation of the findings may be considered. This is not to say that the explanation given above is strictly the correct explanation for a developing economy itself. Indeed, our finding seems not to justify the assumption of using sales as a proxy for demand. Thus, the observation, of prices increasing as quantity increases, points to an identification problem. This will only occur if the supply function is what we have rather than a demand function.

SUMMARY AND CONCLUSION

The main objective of this paper has been to underline the importance of changes in consumers' choice with respect to fish in Nigeria. The paper quantifies those variables, the changes in which, affect internal fish demand in the country.
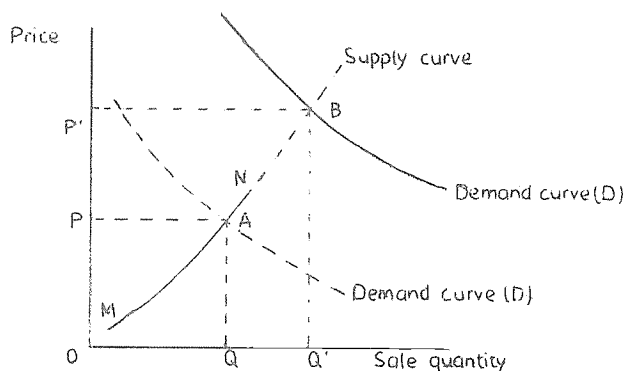
Regression analyses carried out show that a generally rising trend in per capita income will increase the demand for fish, _ceteris paribus_. It is further revealed that even as the price of fish goes on increasing, consumers' demand for it (fish) also tends to rise. This is because prevailing situations in Nigeria with respect to fish supply and demand seem to be such that the country is still far from meeting present (and future) requirements.

There is a pressing need for a fish consumption survey in the country to determine more accurately the country's fish demand with a view to satisfying public fish consumption. Meeting the nation's requirements has immense contributions to make to the process of national development.

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Diagramatic illustration of the relationship between the quantity of fish sold and fish price.