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ESTIMATION OF DEMAND FUNCTIONS FOR EGGS IN PUNJAB —AN ECONOMETRIC STUDY

D. S. Sidhu, M. P. Gupta and A. S. Sirohi*

INTRODUCTION

Reliable estimates of demand and supply elasticities are essential for an evaluation of alternative methods and levels of price support and of trade, transportation, tax, and other policies related to different commodities. Short run analysis based on weekly, monthly or quarterly data (depending upon the nature of the commodity) is useful in discovering the seasonal demand patterns which can be of value in production planning and orderly marketing. To our knowledge, no such investigation on eggs is available in India. This is primarily due to the lack of data on income, family composition and quantities of eggs purchased by the consumers. The relationship between the buyer's income and the number of eggs purchased, between prices and quantities of eggs bought or sold (supplied), and the impact of weather conditions are, therefore, still veiled in darkness.

An understanding of the underlying causes of demand variation would be of considerable interest from both the practical as well as theoretical standpoint. For instance, if it could be shown that differences in the level of egg consumption are due to factors such as income or family size which are clearly outside the influence of the seller, attempts to promote consumption at a place where it is low due to low income may go waste. If weather biases the consumer against consuming eggs, successful demand promotion must include framing of advertisement appeals directed against weakening of such biases. From a theoretical viewpoint, an understanding of the underlying causes of variation would make a contribution to the methodology for analysing consumer expenditure and assist in building up knowledge on stable economic relationship. It is believed that such a relationship exists between the quantity of eggs purchased and income. If this relationship can be isolated and other relationships identified which take account of economic and non-economic variables, it will be of considerable value in predicting demand.[1]

The main objective of this study was to identify those factors which influence fluctuations in demand for eggs,† and to estimate quantitatively

* Professor of Marketing, Department of Economics and Sociology, Punjab Agricultural University, Ludhiana, Joint Director, Agricultural Prices Commission, New Delhi, and Professor of Agricultural Economics, Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi, respectively.

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1. John M. Slater, "Regional Consumer Expenditure Studies Using Food Survey Data," *Journal of Agricultural Economics*, Vol. XX, No. 2, May, 1969, pp. 197-216.

† In this study egg means a hen's egg.

the extent to which these factors influence. The specific objectives of this study were (1) to identify demand functions for eggs, (2) to determine income elasticity of demand for eggs, and (3) to study the influence of factors other than income and price on demand for eggs.

METHODOLOGY

Out of four major egg markets in the Punjab State, Ludhiana market was purposively selected, because it was the most important egg market where open auction was in vogue. Addresses of household consumers who purchased eggs during the second week of June, 1969 from retail-cum-wholesale egg shops located within the municipal limits of Ludhiana city were collected and separate lists of rural and urban consumers were prepared. The urban and rural lists comprised of 1,881 and 804 addresses respectively. From these lists every 10th address was selected as a unit of study sample. Thus, 188 urban and 80 rural households were selected who were administered a 'consumer's schedule.' Some 16 per cent of the selected households could not provide the relevant information and were dropped. In all, a cross-section of 224 households (150 urban and 74 rural) provided primary data in egg consumption[2] and other variables. Out of these, 50 households supplied detailed data on monthly basis and the remaining 174 supplied data on yearly basis only.

Two types of functions were derived from cross-sectional-cum-time-series data. These were:

(1) Demand Functions Derived from Annual Data.

In this case, factors like price of eggs, price of substitutes, temperature and humidity got averaged out and were the same for all observations because cross-section data for one year were available. Therefore, consumption of eggs was regressed on income in deriving the functions. These were termed as 'annual demand functions.'

(2) Demand Functions Derived from Monthly Time-Series Data.

In this case, factors like prices, temperature, and humidity were also included along with the income variable. These functions were termed as monthly demand functions.' The monthly demand functions were further classified into three categories of functions as described below:

(*a*) *Monthly Individual Demand Functions:*—These were obtained from 'individual per capita consumption' as dependent variable.

(*b*) *Monthly Market Demand Functions:*—These were derived for each occupational group separately while taking total consumption of eggs as dependent variable.

2. Since there was no household in the sample which was keeping poultry birds, the terms 'purchase' and 'consumption' of eggs have been used synonymously in this study.

(*c*) *Monthly Aggregate Market Demand Functions:*—The total consumption of eggs aggregated overall the three groups studied was used as dependent variable.

THE ANNUAL DEMAND FUNCTIONS

Selection and Specification of Demand Variables

The data on the following variables were collected:

(1) Quantity of eggs consumed by household,*

(2) Size and age composition of the family,

(3) Family income,

(4) Occupation, and

(5) Number of earning members in the family.

The data were further subjected to the refinements as under:

Per capita consumption of eggs:—The quantity of eggs consumed by a household is influenced among others by its size and age composition. The exclusion of the household size will constitute a specification bias. To avoid this problem, the per capita egg consumption was taken as dependent variable. Regarding age, during pre-testing of the schedule, it was experienced that the age for adult females was not readily available in many cases because of some sociological reasons. Therefore, the age variable (except for children) was dropped. About 93 per cent of the households reported that they do not feed eggs to children of one or below one year of age. Therefore, the total quantities of eggs consumed by a household were converted into per capita basis by applying the formula:

$$\frac{\text{number of eggs consumed by the household}}{\text{number of persons in the household minus children of one or below one year of age}}$$

Per capita disposable income:—It was hypothesized that current per capita egg consumption was a function of per capita disposable income of the current year (1968-69). Thus, the per capita disposable income was:

$$\frac{\text{disposable income of the family during the year}}{\text{number of family members during the year}}$$

Occupation:—This qualitative variable was taken care of by categorizing the families according to their occupation. If some members of a family had different occupations, then the family was placed in that category from

* A household consisted of family members (blood relations) plus servants.

which the major source of disposable income was obtained during the period of this study.

Number of earning members in the family:—In order to know how the consumption patterns of those families having both husband and wife in service differ from those having single earning hand in the same profession, separate regression analysis was run. The households were classified in the following categories:

Category / Occupation	Number of households
Urban	
1. Services	
(*a*) Those having one member in service	69
(*b*) Those having both husband and wife in service..	22
2. Businessmen	59
Rural	
1. Services	36
2. Farmers	38
Total ..	224

Specification of the Model

Income was assumed to be exogenously determined and single-equation least square method was used to find out the effect of income on egg consumption. The scatter of the data indicated that linear and Cobb-Douglas types of functions were relatively more appropriate for the current analysis. The statistical specification of the economic model was, therefore, as under:

$$(1) \quad Y = a + bX \qquad \text{(Linear)}$$

$$(2) \quad Y = a\,X^{b} \qquad \text{(Cobb-Douglas)}$$

where the variables on per capita basis were:

Y = number of eggs consumed during the year 1968-69, and
X = disposable income for the year 1968-69.

'a' and 'b' are unknown estimates of the parameters.

THE MONTHLY DEMAND FUNCTIONS

Selection and Specification of Variables

In addition to the factors already mentioned under annual demand, monthly consumption of eggs is influenced by non-economic variables like

weather and economic factors like price of eggs, and price of the substitute. The variables included in this analysis were, therefore, modified as specified below:

Per capita monthly egg consumption:—The original monthwise data per household were corrected for variability in calendar days by a calendar day adjustment factor which is:

$$\frac{\text{average number of days per month}}{\text{actual number of days in the month}} = \frac{365/12}{\text{actual number of days in the month.}}$$

The per capita egg consumption was worked out as:

$$\frac{\text{adjusted number of eggs consumed per household in the month}}{\text{number of household members minus children of one or below one year of age in the month.}}$$

Per capita monthly disposable income:—The method of working out per capita monthly disposable income was the same as described under annual disposable income.

Price of eggs:—The retail price of eggs is ideal for the type of analysis attempted here, but retail price was not available (without gaps) from any reliable source. The wholesale egg price based on secondary data was, therefore, used instead.

Price of the substitute—milk:—The wholesale buffalo milk price was included in the analysis. But this variable had a high degree of multicollinearity with egg price and temperature and was, therefore, dropped.

Temperature:—There was a widespread belief that eggs have a heating effect on the human body and should not be taken during warm weather.[3] To account for this factor the means of the daily maximum temperature in centigrade at Ludhiana meteorological station were calculated on monthly basis and included as an exogenous variable.

Humidity:—Rainfall and humidity had high degree of multicollinearity. The r_1 value (.94) between monthly rainfall and monthly mean of the daily relative humidity (evening) statistics was significantly different from r_2 (.77) between rainfall and morning humidity series. Hence the evening relative humidity series was selected as an independent variable.

3. This was the main reason given by about 91 percent of the respondents for consuming less number of eggs during summer months.

Specification of Economic Model

The choice of the model to be adopted depends upon the type of data and problem in hand. There are situations where simultaneous approach is of limited importance and application of single-equation approach gives equally good results. Fox[4] enumerates those situations where single-equation is justified in estimating the elasticity of demand. The case of applying single-equation least square approach appeared to be strong in view of the type of data available in this case and short run and static nature of the analysis. Therefore, the demand for eggs for various occupational groups was determined by applying single-equation least square model of the following form and linear and Cobb-Douglas types of functions were fitted.

$$Y = f(X_1, X_2, X_3, X_4, X_5, u)$$

where the variables were :

Y = Per capita number of eggs consumed during the month,

X_1 = Per capita disposable income during the month,

X_2 = Monthly temperature,

X_3 = Monthly humidity,

X_4 = Monthly wholesale price of eggs,

X_5 = Price of the substitute and

u = Error term.

RESULTS AND DISCUSSION

The results of the regression analysis are presented in Table I. In both the models 'b' was significant at one per cent level in all the occupational groups. In all cases, the values of R^2 were significant at one per cent level. The R^2 for the linear functions was found significantly higher than that for the Cobb-Douglas functions in all occupational groups except group II. Linear functions explained about 66 to 96 per cent of observed variation in the consumption of eggs.

A test of homogeneity applied to groupwise functions indicated that populations differed significantly (at one per cent level) from each other. Occupation was, therefore, a significant variable in influencing egg consumption through its influence on income which differed significantly among occupational groups studied here. A graphic presentation of linear demand functions for various occupations studied is given in Figure 1.

4. Karl A. Fox : The Analysis of Demand for Farm Products, U.S. Department of Agriculture, Technical Bulletin No. 1081, 1953, pp. 11-14.

TABLE I—ESTIMATED EGG DEMAND FUNCTIONS (ANNUAL DATA) FOR LUDHIANA (PUNJAB): 1968-69

Eqn. No.	Occupation	Demand Model					
		Linear			Cobb-Douglas		
		Regression coefficients of the variables included			Regression coefficients of the variables included		
		Constant 'a'	Income (X) 'b'	R^2	Constant 'a'	Income (X) 'b'	R^2
Urban							
1.	Service (one person)	19.1246** (8.2715)†	0.0736*** (0.0021)	.9467***	—1.988*** (0.2332)	1.2268*** (0.0674)	.8319***
2.	Service (both husband and wife) ..	84.3715*** (17.7982)	0.0743*** (0.0046)	.9297***	—0.3984** (0.1555)	0.8306*** (0.0445)	.9456***
3.	Business	—47.7123*** (11.5092)	0.0753*** (0.0023)	.9509***	—3.9745*** (0.3375)	1.7500*** (0.0934)	.8604***
4.	Pooled urban	21.2100*** (9.5488)	0.0696*** (0.0022)	.8738***	—1.9930*** (0.2266)	1.2363*** (0.0642)	.7145***
Rural							
5.	Service	—77.3795*** (12.7444)	0.0654*** (0.0029)	.9352***	—6.1212*** (0.6888)	2.3091*** (0.1924)	.8090***
6.	Farming	—153.5992*** (12.5000)	0.0681*** (0.0025)	.9550***	—7.0918*** (0.8763)	2.5209*** (0.2379)	.7571***
7.	Pooled rural	—81.8443*** (14.7894)	0.0592*** (0.0031)	.8323***	—5.6024*** (0.5594)	2.1392*** (0.1524)	.7321***
8.	Total pooled (urban+rural) ..	3.0085 (13.5301)	0.0619*** (0.0030)	.6569***	—2.0119*** (0.2739)	1.2108*** (0.0769)	.5276***

*** Significant at 1 per cent level.
** Significant at 5 per cent level
† Figures in parentheses are standard errors of the regression coefficients.

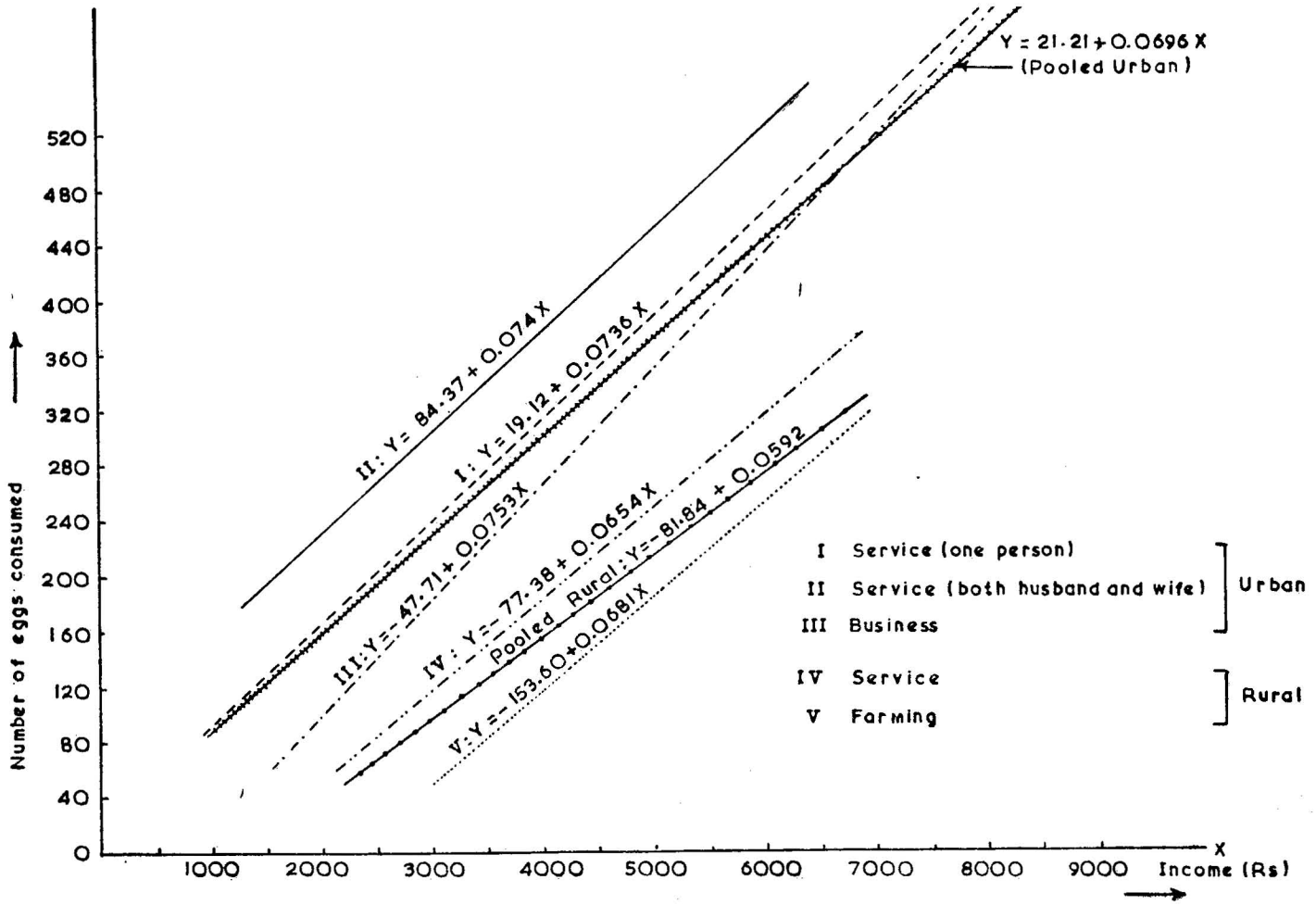

Figure 1 — Linear Demand Functions for Eggs Based on Annual Data for the Year 1968-69 for Ludhiana Market (Punjab)

Testing of Difference between 'a's and 'b's of Various Demand Functions

The differences between 'a' and between regression coefficient 'b' of the functions for the five occupational groups were tested for statistical significance (Table II). It was found that the differences between 'a's in demand functions of various groups were significant at one or five per cent level except in the case of Cobb-Douglas type of demand function of the rural groups. The differences between 'b's did not differ significantly in linear functions but they did so in the case of Cobb-Douglas where again the rural groups were an exception. The regression coefficient of income variable ('b') represents the marginal propensity to consume. It may be noted that the marginal propensity to consume was similar in all occupational groups assuming the demand functions to be linear. However, the level of demand ('a') differed significantly from one group to another. The marginal propensity to consume is the formal expression of Keynes' "fundamental psychological law" which states that consumers increase or decrease their consumption as their income increases or decreases. Because of the significant differences in the level of demand functions ('a') for various occupational groups, the average propensity to consume (quantity) eggs did differ significantly from each other.

TABLE II—TESTING OF DIFFERENCE OF 'a'S AND 'b'S OF VARIOUS DEMAND EQUATIONS (NOS. 1 TO 7 OF TABLE I)†

Enq. No.	Differences between estimates of parameters			
	Linear functions		Cobb-Douglas functions	
	'a'	'b'	'a'	'b'
Urban				
1,2	—65.25***	—0.0007	—1.51***	0.3962***
1,3	66.84***	—0.0017	—2.07***	—0.5232***
2,3	132.08***	—0.0010	3.58***	—0.9194***
Rural				
5,6	76.22***	—0.0027	0.97	—0.2118
Pooled urban and pooled rural				
4,7	103.05***	0.0104**	3.61***	—0.9029***

†Eqn. 1 stands for service (one person) household.
Eqn. 2 stands for service (both husband and wife) households. } Urban
Eqn. 3 stands for business households.
Eqn. 4 stands for pooled urban.

Eqn. 5 stands for service households.
Eqn. 6 stands for farming households. } Rural
Eqn. 7 stands for pooled rural.

*** Significant at 1 per cent level.
** Significant at 5 per cent level.

In the linear functions 'a' values represent the per capita consumption of different groups when income is zero. The value of 'a' was positive for the two service groups which indicated that even if the income of these groups was zero (of course, temporarily and in the short run) they purchased eggs to maintain their standard of living. This was a necessary item of food for them. On the other hand, the remaining three groups had negative 'a' values which means that they started taking eggs only at higher income levels.

This implied that eggs were a luxury item for these groups. The average income levels at which the last three groups started consuming eggs is as under:

Group	Average income level per capita(in Rs.) at which egg consumption started
III. (Urban businessmen)	646.90
IV. (Rural services)	1,198.46
V. (Rural farmers)	2,270.17

The people in the urban area even with low income consumed eggs while the consumption of eggs in the rural areas among the low income group was not perceptible. This might be due to the fact that in the rural areas, people generally met their nutritional requirements from milk and milk products as the majority (63 per cent) of them kept some milch animal. It was observed that the rural families with relatively higher incomes only were regular in the use of eggs in addition to milk.

Income Elasticity of Demand

The regression coefficients of income variable in the Cobb-Douglas equations represent the income elasticities of demand for eggs for various occupational groups. These elasticities are not varying and provide information for comparison of income elasticities for various groups. On the other hand, income elasticities vary also as does the level of income in each group and this information is provided by the linear functions. As such, linear functions were, however, also used for comparing the income elasticity for various groups. For this, the elasticities for various groups were worked at the mean level of income.

Income elasticities of demand for eggs for various occupational groups are shown in Table III.

TABLE III—INCOME ELASTICITIES OF DEMAND FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

	Occupation	Mean value		Demand model/elasticity	
		(Y)	($\overline{X}$)	$Y = a+bX^*$	$Y = aX^b$
Urban					
I.	Service (one person)	265.97	3353.47	0.9281***	1.2268***
II.	Service (both husband and wife employed)	343.99	3495.31	0.7547***	0.8306***
III.	Business	298.69	4599.95	1.1597***	1.7500***
Rural					
IV.	Service	187.46	4049.42	1.4127***	2.3091***
V.	Farming	182.76	4942.28	1.8404***	2.5209***
VI.	Pooled urban	290.28	3864.55	0.9269***	1.2363***
VII.	Pooled rural	185.05	4507.95	1.4421***	2.1392***
VIII.	Total pooled (urban and rural)	255.52	4077.09	0.9876***	1.2108***

* Income elasticities for linear demand model have been computed at arithmetic mean values of Y and X.

*** Significant at one per cent level.

It is seen that all the elasticity values were significant at one per cent level and elasticities were higher for the rural consumers as compared to the urban consumers. The income elasticity was more than unity in the case of both groups of rural consumers. The elasticity was higher for farming occupation than the non-farming group among the rural consumers, the main reason being relatively low level of current egg consumption of the rural farming families at low income level because of easy availability of milk and milk products. As regards the urban consumers, the income elasticity for group II (husband and wife both in service) was less than unity and that for group I (one person in service) was near unity and that for group III (businessmen) was more than unity. The above results imply that for group II eggs were a necessary item. One reason for this, apart from the income level itself, was that those families where both husband and wife were employed, were tight in time in mornings. Eggs are amenable to a variety of preparations which can be cooked in relatively less time. Thus such families were motivated to consume eggs for convenience and to save time.

The income elasticity for pooled urban observations was about unity, for pooled rural it was more than unity, and for total pooled (urban and rural) it was slightly more than unity.

MONTHLY DEMAND FUNCTIONS

Monthly Individual Demand Functions

The scatter diagram and regression analysis of the data revealed that variation in the demand (consumption of eggs) during the various months of the year was mainly a phenomenon of shifting of demand curve upwards to the right or downwards towards the left due to factors such as temperature and humidity. The regression analysis showed that the consumption of eggs increased as the temperature decreased, and the price of eggs increased as the demand for eggs increased due to fall in temperature in winter months. Temperature was found to be negatively correlated with egg prices as well as with egg consumption, thus giving rise to a positive correlation between egg prices and egg consumption. For knowing price effect, data over a number of years were needed. Hence, it was logical to drop the egg price variable from the function. The price of milk as a variable was also left out of analysis on similar grounds. As such the price elasticity of demand for eggs could not be determined from the current analysis.[5]

The monthly individual demand functions with rest of the variables, *i.e.*, income, temperature and humidity are shown in Table IV and Table V.

5. In the case of eggs due to seasonal effects both demand and supply shifted during the year. The demand was highly variable and the supply was relatively less variable. The regression analysis with price as an independent variable was observed as positively correlated with quantity demanded. In view of this the functional relationship so obtained was identified as supply relationship and demand function with price as independent variable remained unidentified.

TABLE IV—MONTHLY INDIVIDUAL DEMAND FUNCTIONS FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

Model : Linear (Urban)

Group No.	Variables taken	Regression coefficients of the variables included in the function				R^2
		Constant 'a'	Income 'b_1'	Temperature 'b_2'	Humidity 'b_3'	
I.	$Y = f(X_1, X_2, X_3)$	32.6555*** (1.4505)	0.0853*** (0.0022)	—1.0483*** (0.0443)	—0.0317† (0.0209)	.8862***
	$Y = f(X_1, X_2)$	32.3416*** (1.4392)	0.0853*** (0.0022)	—1.0693*** (0.0422)	—	.8853***
II.	$Y = f(X_1, X_2, X_3)$	43.2802*** (2.0314)	0.0773*** (0.0073)	—1.1586*** (0.0621)	—0.0492*** (0.0292)	.8931***
III.	$Y = f(X_1, X_2, X_3)$	31.0324*** (1.9927)	0.0896*** (0.0035)	—1.1993*** (0.0633)	—0.0419† (0.0313)	.8599***
	$Y = f(X_1, X_2)$	30.7014*** (1.9826)	0.0894*** (0.0035)	—1.2268*** (0.0600)	—	.8582***
Pooled urban	$Y = f(X_1, X_2, X_3)$	35.6945*** (1.2288)	0.0779*** (0.0018)	—1.0824*** (0.0379)	—0.0351* (0.0182)	.8329***

*** Significant at 1 per cent level.
* Significant at 10 per cent level.
† Significant at 20 per cent level.

TABLE V—MONTHLY INDIVIDUAL DEMAND FUNCTIONS FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

Model : Cobb-Douglas (Urban)

Group No.	Variables taken	Regression coefficients of the variables included in the function				R^2
		Constant 'a'	Income 'b_1'	Temperature 'b_2'	Humidity 'b_3'	
I.	$Y = f(X_1, X_2, X_3)$	—0.0097 (0.8779)	2.6090*** (0.2099)	—2.8939*** (0.4975)	—0.5460* (0.2807)	.4253***
II.	$Y = f(X_1, X_2, X_3)$	1.3740*** (0.1289)	0.8866*** (0.0302)	—1.3536*** (0.0734)	—0.0803* (0.0414)	.8989***
III.	$Y = f(X_1, X_2, X_3)$	0.1509 (0.1999)	1.3862*** (0.0675)	—1.5323*** (0.1098)	—0.0447 (0.0644)	.7806***
	$Y = f(X_1, X_2)$	0.1252 (0.1961)	1.3833*** (0.0672)	—1.5534*** (0.1053)	—	.7790***
Pooled urban	$Y = f(X_1, X_2, X_3)$	0.3074 (0.4587)	1.8739*** (0.1102)	—2.1502*** (0.2610)	—0.3057** (0.1504)	.3943***

*** Significant at 1 per cent level.

** Significant at 5 per cent level.

* Significant at 10 per cent level.

It is evident from Table IV that linear demand functions for the pooled data indicated that 83 per cent of the observed variation in consumption of eggs is explained by the change in income, temperature, and humidity. The occupational groupwise analysis showed R^2 values varying between 0.83 and 0.89. The regression coefficients of income and temperature variables were significant at one per cent level in each function and that of humidity were significant at 20 per cent level except for group II where it was significant at one per cent level.

Table V gives monthly demand functions of Cobb-Douglas type. It is observed that this model gave significantly lower R^2 (.39) as compared to R^2 value of .83 in linear model for the pooled data. Groupwise functions also showed significantly lower R^2 values except for group II. The regression coefficients of income and temperature were significant at one per cent level for each function. The regression coefficient for humidity was significant at ten per cent level for group I and II, at five per cent level for pooled function and not significant for group III.

It may be noted that as expected the coefficient of income was positive and that of temperature and humidity negative in all the functions fitted.

Monthly Market Demand Functions

The variables taken for the functions did not show high degree of intercorrelation as compared to multiple R values obtained for the functions given in Table VI. The 'd' values (Durbin-Watson 'd' statistic) for the functions with significant variables indicated presence of autocorrelation in the series. To remove the presence of autocorrelation the variables were transformed and the analysis re-run. Table VII gives the functions fitted with the transformed variables. The 'd' test showed the absence of autocorrelation in the transformed series. The aggregation of the individual observations into market data improved the R^2 value in the case of Cobb-Douglas model. The coefficient of income variable was significant at one per cent level in both models and temperature was significant at one per cent level for linear model and at five per cent for Cobb-Douglas model.

Monthly Aggregate Market Demand Functions

Table VIII gives the functions obtained from the same urban data aggregated over 12 monthly observations for all the consumers of all the three groups. This series was free from multicollinearity and also from autocorrelation. The coefficients of both income and humidity were not significant. This might be due to the averaging effect of aggregation in monthly income levels. The R^2 values showed a significant improvement over market demand functions and temperature alone explained about 93 to 94 per cent of the variation in aggregated market demand.

TABLE VI—MONTHLY MARKET DEMAND FUNCTIONS (URBAN) FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

Eqn. No.	Variables taken	Regression coefficients of the variables included in the functions				R^2	'd' value
		Constant 'a'	Income 'b_1'	Temperature 'b_2'	Humidity 'b_3'		
Model : Linear							
1.	$Y = f(X_1, X_2, X_3)$	372.3850*** (131.5188)	1.9488*** (0.4072)	—18.8030*** (1.7224)	—0.9257 (0.8123)	.8328***	—
2.	$Y = f(X_1, X_2)$	372.7469*** (132.1126)	1.9166*** (0.4080)	—19.4085*** (1.6458)	—	.8261***	0.9843††
Model : Cobb-Douglas							
3.	$Y = f(X_1, X_2, X_3)$	1.5194† (0.9758)	1.3544*** (0.3882)	—1.5247*** (0.5550)	—0.0795 (0.0879)	.7890***	—
4.	$Y = f(X_1, X_2)$	1.5214† (0.9731)	1.3309*** (0.3862)	—1.5643*** (0.1487)	—	.7836***	0.7147††

*** Significant at 1 per cent level.
† Significant at 20 per cent level.
†† Autocorrelation present.

TABLE VII—MONTHLY MARKET DEMAND FUNCTIONS (WITH TRANSFORMED VARIABLES) FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

(Urban)

Eqn. No.	Variables taken	Regression coefficients of the variables included in the functions				R^2	'd' value
		Constant 'a'	Income 'b_1'	Temperature 'b_2'	Humidity 'b_3'		
Model : Linear							
1.	$Y = f(X_1, X_2)$	75.8779	2.4622*** (0.3419)	—17.4622*** (2.1319)	—	.7315***	2.1642
Model : Cobb-Douglas							
2.	$Y = f(X_1, X_2)$	—0.6214	1.4240*** (0.1625)	—0.2769*** (0.1193)	—	.7748**	1.569

*** Significant at 1 per cent level.

** Significant at 5 per cent level.

TABLE VIII—MONTHLY AGGREGATE DEMAND FUNCTIONS FOR EGGS IN LUDHIANA (PUNJAB): 1968-69

(Urban)

Eqn. No.	Variables taken	Regression coefficients of the variables included in the functions				R^2	'd' value
		Constant 'a'	Income 'b_1'	Temperature 'b_2'	Humidity 'b_3'		
Model : Linear							
1.	$Y = f(X_1, X_2, X_3)$	—1414.4757 (4172.7538)	4.7706 (4.6676)	—56.3865*** (4.6832)	—3.9264 (2.9130)	.9547***	3.1735†††
2.	$Y = f(X_2)$	2828.2787*** (139.7246)	—	—57.2442*** (4.3992)	—	.9442***	2.9136†††
Model : Cobb-Douglas							
3.	$Y = f(X_1, X_2, X_3)$	4.1891 (13.7508)	0.3769 (4.6879)	—1.5011*** (0.1563)	—0.0624 (0.1091)	.9297***	1.6694†††
4.	$Y = f(X_2)$	5.2547*** (0.2029)	—	—1.5285*** (0.1367)	—	.9259***	2.9136†††

*** Significant at 1 per cent level.

††† No autocorrelation present at 1 per cet level.

One conclusion is obvious from the foregoing monthly demand analysis. The analysis has validated the widely held view that egg consumption is strongly influenced by weather conditions specially the temperature.

POLICY IMPLICATION OF THE STUDY

The major finding of this study was that the income elasticity of demand for eggs is more than unity. This means that as the per capita income increases, the increase in the demand for eggs will be more than proportionate.

The effects of an increase in income on prices and outputs of commodities depend on their comparative income elasticities of demand and price elasticities of supply. The commodities with great income elasticities of demand experience proportionately greater expansion in output. Given sufficient differences in those two elasticities, the results of an increase in income will hinge on their relative strengths. For, together they determine whether the rise in income will find its effect primarily in greater production or primarily in price increases.

Further implication of income elasticity of demand is that the increased demand of eggs is likely to put more pressures on the existing marketing system. For facilitating development of the poultry industry, it will be essential to rationalise the existing marketing system so that marketing services are efficiently performed for the benefit of both producers and consumers.[6]

Another finding of the study is the seasonal pattern of consumption of eggs. During winter, egg consumption is several times more as compared to summer season because of the effect of temperature and humidity and the belief that egg has a heating effect on human body. For stabilizing demand during a year, it is necessary to enlighten the consumer on this wrong notion. Hence, advertisement appeals should be beamed to motivate consumers to take eggs during summer months also. However, this is likely to take long before the consumers adopt new egg consumption patterns because old habits die hard. For immediate solution, provision of cold storages and processing of eggs is essential. This will help in orderly marketing of this product.

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6. Steps needed to rationalise the existing marketing system are given in D. S. Sidhu and P. S. Rangi, "Price Structure of Eggs in the Punjab," *Journal of Research*, Vol. VIII, No. 4, 1971, pp. 498-503.