International Journal of Modern Agriculture
ISSN: 2305-7246
Volume 10 Issue 2, 2021

An Estimation of Expenditures, Own and Cross Price Elasticities of Milk in Pakistan.

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ABSTRACT

In the last few decades more attention is given to consumer demand analysis in the country as well as worldwide. The rise in the prices of food commodities in Pakistan improved the researcher concentration in the pragmatic study of consumer demand analysis. The income and price demand elasticities are of paramount importance in understanding the consumers' behaviour of the country. Working lesser model is used to evaluate the household's demand, expenditures, own and cross-price elasticities for milk and its product in rural and urban regions of Pakistan in this study. For this purpose, Household's Integrated Economics Survey (HIES) cross sectional data for the year 2013-14 with a sample size of 17989 was used. The results revealed that rural households spend more income on food items as compared to urban households. The estimated expenditure elasticities of selected milk products in both the regions were inelastic except other milk products in rural region.The own price elasticities for all selected milk products were negative and price inelastic except milk fresh in both the regions, milk pack in rural region. while, yoghurt in both the regions were price elastic. All the cross-price elasticities of milk products were negative and less than unity which reveals that these products are compliments.Based on the findings of this research

study it is recommended that any increase in the prices of fresh milk and yoghurt will result significant decrease in their consumption and for food insecure household's government should supply fresh milk and processed form in subsidizing prices in utility stores.

Key Words: Milk Consumption, Expenditure Elasticities, Own and Cross Price Elasticities, Urban & Rural Region, Pakistan.

1. INTRODUCTION

Milk and milk products have been widely used as food items by human beings in all ages throughout the history. Milk contains fats, minerals, carbohydrates and vitamins. Thus, milk having all the essentials nutrients is almost a complete natural food itself. Although there is no doubt that milk is good at every age for robust health, however it is relatively more important and essential for infants. It is also considered as an essential element in the kitchen. Milk a lacteal secretion having pleasant and sweet taste, which is due to a unique and balance between lactose and chloride nutrients. Higher fat and protein contents give a fuller flavor (Sajjad et al., 2010). According to the recent estimates world-wide milk production is about seven hundred and thirty million tons per year (FAO, 2016). The importance of dairy industry is widely recognized throughout the world. Milk is one of the major food items in all over the world and a substantial part of food expenditures are incurrent are milk and its products. Worldwide in urban areas per capita monthly expenditure on milk and milk products is more than cereals, while in rural areas it second after cereals. About 31% of milk and dairy products consumption occur in developed countries of the world. The fastest growth consumption of milk per annum is recorded in South and East Asia during 2014. It is projected that the milk demand in the developing countries well be raised by 27 percent in 2030. The main feature that adjusts the market price equilibrium of any commodities is the demand (GoP, 2019).

The world top ten producing countries of milk are "India, America, China, Pakistan, Brazil, Germany, Russia, France, Turkey and New Zealand. India being the leading country of the world is having an annual milk production of 146.31 million tons followed by the united stated of America (95.3 million tons), China (45 million tons) and Pakistan having fourth position with an annual production of 42 million tons (FAO, 2016). The importance of the dairy industry is not only limited to the production of milk and its products only, since it provides income and food to a significant portion of the population in the country. In our country more than eight million families

which are mostly belonged to the rural region is engaged in raising livestock. It contributed 60.6 percent in the agriculture while 11.7 percent to the national GDP. It accounts more than 3.1 percent total export. The livestock sector is a main component in our national economy and is considered an economy engine for poverty reduction in the country. Dairy products play main role in Pakistan economy. Within the livestock sector milk and its products contribution is 72 percent (GoP, 2019).

Milk is consumed as fresh milk, powdered milk, processed milk, yogurt, in the form of whey (Lassie), clarified butter (ghee), cheese, ice cream, sweets and other dairy products in the world demand for milk is growing mainly due to rapid growth in population, higher per capita income and also due to the increased awareness of its nutritional value among the masses (Burki et al. 2011). Milk demand in Pakistan follow a cyclical pattern. Its demand is very high in the summer season while low in winter season. Milk in Pakistan comes from different types of livestock including cattle, buffalos, sheep and goats. As compared to other developing countries of the demand for milk is low in our country. This decrease in per capita milk consumption is due to increase in prices of milk and rising population. Like other farm product in the country the milk production has not been researched adequately (GoP, 2019). It is challenge for the country that how to increase the production of milk to fulfill the domestic demand.

In the last few decades more attention is given to consumer demand analysis in the country as well as worldwide. Besides income and price, there are other factors with determine the demand for milk. The rise in the prices of food commodities in Pakistan improved the researcher concentration in the pragmatic study of consumer demand analysis. The income and price elasticities of demand is important for our understanding regarding the consumers' behaviour in the country. In developing countries like Pakistan milk and its products demand is increasing so fast that it is essential to know the demand structure of dairy products. The main purpose of this research is to study the theoretical concepts of demand analysis of milk and its products in the country and to gauge the balance between the consumer demand and supply which is one of the most important issues for the economic development. This study will also fulfill the literature gap by adding to the existing literature and will provide policy guidelines for policy makers in the formulation of policies regarding milk consumption decisions in Pakistan.

MATERIAL AND METHODS

The universe of this study is rural and urban areas of Pakistan. Household Integrated Economic Survey (HIES) 2013-2014 data is used for this purpose. Keeping in view the reliability of estimates and field resources available a sample of size 19620 households distributed over 1368 PSUs (567 urban and 801 rural) has been considered sufficient to produce reliable estimates in respect of urban and rural areas, however data is collected from 1307 PSU'S (556 urban and 751 rural) by covering 17989 household.The study used sample size of 1307PSUs which cover 17989 households.

DATA ANALYSIS

Data was analyzed by using different software's for the estimation of working –lesser model. For estimation of income and expenditure of households, total number of household were converted to adult equivalent and monthly household expenditure is be taken as proxy of income.To estimate the total expenditure of milk and its products in Pakistan for their individual prices and share of selected milk products was analyzed.For the estimation of demand function prices of selected milk products, adult equivalent, monthly house-holds expenditure and regional dummy (rural and urban) is analyzed.

MODEL SPECIFICATION AND ESTIMATION

The first empirical model applied in this research is working-Lesser model and its original form was study is the Working-Leser model. The original form of the Working-Leser model was discussed by Working (1943) and Leser (1963). Intriligator, Bodkin and Hsiao (1996) and Deaton and Muellbauer (1980a) provide a more detailed discussion of this functional form. In the Working-Leser model, each share of the food item is simply a linear function of the log of prices and of the total expenditure on all the food items under consideration. The Working-Leser food demand function can be expressed as:

$$w_i = \alpha_0 + \alpha_i \log x + \sum_j \beta_{ij} \log p_j + \sum_k \gamma_{ik} H_k + \varepsilon_i$$

Where i,j represent the milk products

Wi = Buget share of the milk products

Pj= Price of milk product j.

X = Total expenditure on milk and its products

HK = Dummy variable such as rural or urban, all the four provinces, adult equivalent.

AdEq = Log of Adult Equivalent

Ei = Random disturbances i-e. With zero mean and constant variance.

3.5 EXPENDITURE ELASTICITY ESTIMATION OF MILK AND ITS PRODUCT

$$e_i = 1 + \left(\frac{\alpha_i}{w_i} \right)$$

Where

Ei = Expenditure elasticity

αi = log of total expenditure of milk and its products.

wi = Mean share of milk and its products.

3.6 OWN AND CROSS PRICE ELASTICITIES

$$e_{ij} = -\delta_{ij} + \left(\frac{\beta_{ij}}{w_i} \right) \qquad \forall i, j = 1, \ldots, n$$

Where i,j= 1,…….,n

δ_{ij} = kronecker delta, in own price it will be equal to one while in cross price it will be equal to zero.

Wi = mean share of each milk product

ßij= coefficient of each milk product.

RESULTS AND DISCUSSION

This chapter is organized into eight different sub-sections. The first section of this chapter focuses on the average monthly household expenditure on food and non- food commodities. Section 2 shows the results of average monthly household expenditure on milk and its products. The results of estimated Working-Lesser model of milk and its products for both rural and urban regions are explained in section 3. Remaining sectionsi.e 4^{th} and 5^{th} shows estimated expenditure elasticities, own and cross price elasticities of selected milk products respectively.

Household's Expenditures on Food and Non-Food commodities.

Forthe year 2013-14 HIES accounts the total consumption of all the commodities. The total consumption consists of all the food commodities, fuel, utilities and housing rents etc. The other non-food commodities expenses included the transportation, stationary and schooling etc.

Table 1 provides some descriptive statistics for the average monthly household expenditure on food and non-food items. The table shows that the average monthly household expenditure on food items is 55%, while on non-food items it is 45%. In rural region the average expenditure on food items are 60%, whereas on non-food items are 40%. In urban region the expenditure 47% on food items while 43% on non-food items. The results further revealed that the rural people spends more income on food items and less on non-food items, while the urban people spends more on non- food items and less on food items.

Table 1: Average Monthly Household's Expenditure on Food and Non-Food Items (Rs/Month)

Average Monthly household expenditure	**Overall**	**%age**	**Rural**	**%age**	**Urban**	**%age**
Total Food Items	14985	55%	14205	60%	16456.4	47%
Non-Food Items	12421.5	45%	9174.9	40%	18543.49	53%
AverageMonthly Expenditures	27407.11	100%	23380.4	100%	34999	100%

Source: Author'sown calculations using HIES, 2013-14.

Household's Expenditure on Milk and its Products

Table 2 shows that the average total monthlyhouseholds expenditureon milk and its products is Rs.6924.98,while the rural/ urban disaggregation show that households in rural region spends Rs.7285.99andin urban region average monthly expenditure is Rs 6146.78, which reveals that rural people consume more milk and its products as compare to urban households.

Table 2: Average Monthly Household' Expenditure on Milk (Rs/Month)

Milk products	**Overall**	**%age**	**Rural**	**%age**	**Urban**	**%age**
Milk fresh	2683.53	38.75%	2899.017	39.78%	2254.164	36.67%
Milk cheese	549.2866	7.93%	602.7476	8.27%	420.98	6.84%
Milk pack	1087.832	15.70%	967.6624	13.28%	1170.331	19.03%
Milk powered	1380.616	19.93%	1475.441	20.25%	1324.925	21.55%
Yogurt	390.3297	5.63%	466.5221	6.40%	313.2281	5.095%
Others	833.3942	12.03%	874.6027	12.003%	663.1527	10.78%
Total expenditure	6924.9885	100%	7285.993	100%	6146.781	100%

Author's own calculations using HIES' 2013-14.

Estimated Expenditure Elasticity of Milk Product

The estimated results of expenditure elasticities for both the region are presented in the table 3 show that the expenditure elasticities for all the selected milk products in both the region are price inelastic because their expenditure elasticities are less than 1. It means that rise in the total expenditures by 1% would tend to increase the expenditures by 0.82, 0.87, 0.48, 0.86, 0.11, 0.23, 0.04, 0.06, 0.68, 0.55 and 0.9 respectively. Results of the table indicate that all the six products are normal goods. Only the other milk products in rural region have expenditure elasticity greater than 1, it means that the other milk products in rural region are luxury good.Finding of the study reveals that expenditure elasticities of milk products for both the rural and urban regions less than unity except the elasticity of other milk products, which is consistent with the previous study conducted by (Agbola , 2003; Jan *et al*., 2008b).

Table 3: Table of Expenditure Elasticities of Milk Products

Milk products	**Rural**	**Urban**
Milk fresh	0.82	0.87
Milk cheese	0.48	0.86
Milk pack	0.11	0.23
Milk powered	0.047	0.06
Yogurt	0.68	0.55
Others	1.37	0.9

Author's own calculations HIES 2013-2014.

Own and Cross Price Elasticities of Milk and its Products

Table 4 shows the own and cross-price elasticities of milk and its products in rural and urban region of Pakistan.In both the region all the own price elasticities of selected milk products have the right sign and are significant. This reveals that all the dairy products are normal goods, hence their consumption decreases when their price increase. These finding is in accordance with the law of demand. Own-price elasticities for milk fresh in both the region are negative and greater than unity indicating that demand for milk fresh in both the region is very elastic, which is consistent

with the previous study conducted by (Balagtas*et al*., 2006) while the cross-price elasticities for both the region is inelastic. Own price elasticities of milk cheese is -0.28 in rural region while -0.75 in urban region which state that inelastic demand in both the region while cross-price elasticities of milk fresh are also inelastic in both the region. Own price elasticities of milk pack in rural region is elastic while in urban it is inelastic. Cross-price elasticities for milk packis inelastic in both the region. Both the own and cross price elasticities of milk powered in both region is inelastic. In both the region yoghurt own-price elasticities is elastic while cross price elasticities for yoghurt in both the region is inelastic. Own-price elasticitiesfor others milk products in both the region is inelastic while cross-price elasticities for others milk products are also inelastic.Results of own price elasticities for selected milk products revealed that all the own-price elasticities are price inelastic and less responsive to its own-price change, except the elasticities of milk fresh, yoghurt and milk pack in rural region is price elastic.Finding of some previous studies are also with accordance that all selected milk products are normal goods (Moschini, 1995, Jan et al, 2008b).

Table 4: Table of Own and Cross Price Elasticitiesof Milk and its Products.

Milk and milk products		**Rural**	**Urban**
Milk fresh	**Own price**	**-1.27**	**-1.34**
Cross price	Milk cheese	-0.13	-0.57
	Milk pack	-0.33	-0.44
	Milk powered	-0.27	-0.23
	Yogurt	0.32	-0.23
	Others	-0.04	0.08
Milk cheese	**Own price**	**-0.28**	**-0.75**
Cross price	Milk fresh	-0.67	-0.1
	Milk pack	-0.75	-0.24
	Milk powered	3.44	-3.70
	Yogurt	-0.45	0.26
	Others	-0.20	-0.39
Milk pack	**Own price**	**-1.46**	**-0.83**
Cross price	Milk fresh	0.55	0.23
	Milk cheese	-0.47	-0.10

	Milk powered	-0.02	-0.13
	Yogurt	0.49	0.16
	Others	-0.20	-0.17
Milk Powered	**Own price**	**-0.35**	**-0.38**
Cross price	Milk fresh	0.51	-1.02
	Milk cheese	0.8	-0.42
	Milk pack	-0.77	-0.88
	Yogurt	0.56	0.47
	Others	-0.04	0.12
Yogurt	**Own price**	**-1.29**	**-2.21**
Cross price	Milk fresh	-0.03	-1.20
	Milk cheese	-3.23	-0.22
	Milk pack	0.09	0.40
	Milk powered	-0.20	0.14
	Others	-0.03	0.02
Others	**Own price**	**-0.84**	**-0.67**
Cross price	Milk fresh	-0.95	-0.97
	Milk cheese	0.92	-0.97
	Milk pack	-0.45	0.07
	Milk powered	0.54	0.18
	Yogurt	0.45	-0.11

Author's own calculations HIES 2013-2014.

Conclusion and Recommendations:

Empirical estimates of demand elasticities have great importance for market analysis of food products. Most of the studies have examined estimates of demand elasticities for milk products but they have usually been related to only few product categories. The current study has analyzed the rural and urban region consumption of six different types of milk products: fresh milk, milk cheese, milk pack, milk powdered, yoghurt and all other milk products. In economics literature, besides tastes and prefrences and income, the responsiveness of change in the prices of a good is termed as elasticities of demand. All the result in the current study are consistent with the economic theory. The results revealed that the expenditure elasticities in both the regions for all

milk products are positive and less than 1 confirming that they are normal goods. The inelastic own price elasticities of demand showed that all the milk product under study are necessities, except milk fresh and yoghurt in both the region. The results of the cross-price elasticities revealed that all the milk products are necessities except in the case of milk cheese the cross-price of powdered milk has elastic demand showing is luxurious nature for urban house households. From the results of this research it is recommended that any change in the fresh milk and yoghurt prices will significantly affect its consumption. For food insecure household's the government should focus on price stability of all the milk items as it a rich source of calcium and protein is essential for normal body growth.

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