

## Welfare impacts of food price inflation in Pakistan

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### Abstract

The objective of the study was to examine the welfare effects of price changes on food items in Pakistan between two survey data of 2001-02 and 2005-06 which were taken from Household Integrated Economic Survey of Pakistan. The rationale of the study is related with the outsized budget shares of food items including in the consumer basket. Food expenditures are mainly inelastic in nature; however, the expenditures on non-food commodities can be overdue. The present study focuses on the magnitude of the cost involved in increasing the welfare among various income groups, using equivalent income and equivalent variation method. Moreover, the study analyzes the welfare effects for rural-urban segments of Pakistan. As there are considerable differences in the composition of the consumption basket between rich and poor, therefore, the survey data of both years is disaggregated into four sub-samples according to the expenditure levels of rural-urban segments based on head count index. The results indicate the degree of vulnerability increases among the poorest households when staple food price increases. While in case of meat, this percentage change is low for poorest. It is evident that cereals, pulses and dairy products are the major source of welfare in urban, rural and overall Pakistan.

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### **Introduction**

Pakistan is amongst the nations which are experiencing high inflation rates during the past few years. The general consumer price index (CPI) of Pakistan has increased from 103.54 in 2001-02 to 191.91 in 2008-09. This indicates that general price level has increased by more than 85% during last seven years. The situation is even worst in case of food inflation, as it has shown an increase of more than 110% during the same period (GoP, 2010). High Inflation is a harmful phenomenon with terrible impact on national welfare. An increase in prices results into a decreased purchasing power as people can not afford to buy goods in quantities they need which leads to a lower level of welfare in the society (Joy, 1973). The sharp rise in prices increases the hardship of all but adversely affects those who are already below the poverty line and who belong to fixed income groups. Rise in general price level is though harmful, but if it is followed by an equivalent increase in nominal income then its effects are offshoot. The statistics show that in general it apparently seems to be true for

Pakistan. Per capita income in Pakistan has recorded a rise of more than 210% during last seven years (GoP, 2010).

According to Household Integrated Economic Survey (2005-06), the percentage increase in the average monthly income of lower quintile is 23.53%, while this rise is 85.83% for the upper quintile from 2001-02 to 2005-06. These statistics clearly indicate that the increase in average monthly income of rich class is 3.6 times more than the increase in average monthly income of lowest quintile. Hence all segments of the society are not equally affected by the rise in the price level. Generally poor are affected to a larger extent (FAO, 2004). The empirical analysis of price changes on consumption patterns has always been of great concern to development economics. Though the area is quite unexplored in Pakistan but there exists enough international literature on the exploring the welfare effects of price changes. In this regard, this study presents review of the studies estimating welfare effects through equivalent variation and compensation variation.

Creedy (1997) examined the welfare effects of

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the differential price changes associated with inflation over the period 1980 to 1995 in Australia. Equivalent variations and equivalent income were calculated for 29 households' expenditure groups considering fourteen commodity groups. The results showed that in the early 1980s, due to the price changes a systematic higher burden was faced by lower income groups. But by the middle to late 1980s, this effect becomes negligible, and in some cases more burdens was faced by the middle income groups. The period (1980-87) during which relatively higher burden was borne by the lower income groups coincide with the periods of higher increase in the CPI. In another study of Creedy (1999), his analysis the welfare affects of several indirect tax reforms in Australia for selected household types and for fourteen commodity groups. The welfare changes were measured in terms of equivalent variations and equivalent incomes for each household type and for each expenditure group. The results suggest that the extent of vertical redistribution involved in the current indirect tax structure, along with possible reforms to it, are small.

Ackah and Appleton (2005) examined the welfare effects of trade and agricultural policy reforms for Ghanaian households during year 1991-92 and 1998-99. The welfare effects of price changes are calculated for cereal, tubers, fish, meat, alcohol and all other food in terms of compensating variations. The results suggest that household consumption did respond to relative prices and real income change resulted from policy reforms. It was found that all household groups suffered and welfare losses arising from the food price increases during the 1990s. On average, Ghanaian households need compensation of about 20.2 percent of their 1991-92 total household expenditures for the food price changes they faced during the 1990s. However, there is some heterogeneity in the impact of price variations on households. The results indicate that the burden of higher consumer prices fell largely on the rural poor. Thomson and Carmen (2007) estimated distribution of the short-term economic welfare effects as a result of assumed food price changes in that country following accession to the European Union. Using the Slutsky technique based on construction of Laspeyres indexes, the compensatory variation in income corresponding to food price changes is calculated for 12 types of Romanian household, and disaggregated into market and non-market demand components. Results shows that the change of relative Romanian food prices to the Hungarian post-accession pattern and an 8 percent increase in inflation level affected welfare differently for various categories of households. Although on average the welfare effect is only 2.6 percent, a

higher impact is estimated for low-income groups, in particular those groups for which food expenditure represents a greater share of total income (i.e., farmer, unemployed, pensioner and self-employed households). Taken together, these groups represent the majority (66 percent) of Romanian households.

Later on, Drezgie (2008) explored the redistributive effects of inflation in Croatia in period from 2000 to 2007. The estimated measures showed that redistributive effects of inflation in Croatia do not depend on the level of overall inflation rate. Such findings confirm the results that there are no significant redistributive effects in case of high level of inflation. Wood and Nogueira (2009) focused on quantifying the welfare losses for Mexican households due to the world food price increases from 2006 to 2009. The authors measured the welfare effects of tortilla price increase, differentiating by household status (poor and non poor) and by region (border, north, central and south). The study focuses on the main staple foods to accurately represent the Mexican diet. An appropriate welfare analysis based on compensating and equivalent variation for the representative commodities, differentiated by geographic region and household status, observes small welfare losses for non poor large differences for poor and non poor households. Adding tortilla income loss to compensating variation it is found that non-poor households lose 9 percent of their food budget, on average, and poor households lose about 18 percent of their food budget, on average. So the relative loss of poor households is double than the loss of non-poor households, which demonstrates the vulnerability of these households to food price increases. These results provide evidence that poor Mexican households are the ones who experience significant welfare losses from significant food price increase.

Alem (2011) investigate how urban households in Ethiopia coped with the food price shock between 2004 and 2008. Regression results indicate that households with low asset levels, and casual workers, were particularly adversely affected by high food prices. Robles and Keefe (2011) analyses the welfare and poverty effects of the 2007-08 food-price crisis on households in Guatemala. Estimates reveal that the price increases negatively affected 96.4 per cent of households and resulted in a 1.1 per cent increase in the national poverty rate.

The present study investigates the welfare effects of price changes in Pakistan, based on two household integrated surveys i.e., 2001-02 and 2005-06. The study examines the magnitude of the cost involved in increasing the welfare among various income groups

Table 1. Poverty line by regions (per adult equivalence)

Years	Urban Pakistan	Rural Pakistan
2001-02	929.6	716.3
2005-06	1249.47	961.296

Source: GoP (2010)

Table 2. Household groups based on headcount index

Group	Description
Group 1: Poor	Per Adult Equivalent Income < Poverty Line
Group 2: Marginally Non-Poor	Poverty line < Per Adult Equivalent Income < 1.5 Poverty Line
Group 3: Middle Class	1.5 Poverty line < Per Adult Equivalent Income < 2 Poverty Line
Group 4: Rich	2 Poverty Line < Per Adult Equivalent Income

Source: GoP (2011)

Table 3. The distribution of households

Years	2001-02			2005-06		
	Rural	Urban	Total	Rural	Urban	Total
<b>Group 1: Poor</b>	17.09%	29.63%	22%	21.62%	30.80%	26.30%
<b>Group 2: Marginally Non-Poor</b>	23.58%	32.38%	26.74%	28.42%	34.09%	30.90%
<b>Group 3: Middle Class</b>	20.87%	18.94%	20.12%	20.84%	19.88%	19.98%
<b>Group 4: Rich</b>	38.45%	19.05%	31.52%	27.78%	15.24%	22.81%

Source: Authors calculations

Table 4. Classification of food groups

Food Groups	Details
Group 1 Cereals	Wheat and wheat flour, Rice and rice flour and Other cereal products
Group 2 Pulses	Gram, mash, moong, masoor and other pulses
Group 3 Dairy products	Milk (fresh and packed), Butter, Curd/yogurt and Other dairy
Group 4 Edible oil and fats	Desighee, Vegetable ghee, Edible oils and Other edible oils/fats
Group 5 Fruits	Banana, citrus, apples, other fresh fruits, dried fruits and canned fruits
Group 6 Vegetables	Potato, tomato, onion and other vegetables
Group 7 Tea/coffee	Tea (black and green) and coffee
Group 8 Sugar/Gur	Sugar (desi and milled), gur and shakkar and honey
Group 9 Ready-made food	Pastries, biscuits, canned food and other baked items
Group 10 Tobacco	Cigarettes pan and accessories and other tobacco products
Group 11 Meat	Mutton, beef, fish, chicken and other meat
Group 12 Spices and condiments	Salt, chillies and other spices
Group 13 Soft drinks	Juices and other drinks

Source: HIES (2001-02, 2005-06)

Table 5. Percentage distribution of household expenditures on each food group

Food Groups	2001-02			2005-06		
	Rural Pakistan	Urban Pakistan	Pakistan	Rural Pakistan	Urban Pakistan	Pakistan
1 Cereals	12.58%	12.02%	12.28%	13.39%	12.73%	13.04%
2 Pulses	10.99%	10.61%	10.79%	10.58%	10.25%	10.41%
3 Dairy	19.76%	18.37%	19.02%	21.82%	20.19%	20.95%
4 Vegetables	8.55%	8.72%	8.97%	8.85%	7.43%	8.78%
5 Fats and oil	7.57%	7.58%	7.57%	8.61%	8.50%	8.55%
6 Spices	3.27%	3.78%	3.54%	3.23%	3.74%	3.50%
7 Sugar	8.46%	8.37%	8.41%	7.97%	7.94%	7.95%
8 Tea	2.97%	3.51%	3.26%	2.54%	3.13%	2.86%
9 Meat	10.74%	10.39%	10.55%	8.86%	8.72%	8.78%
10 Fruits	3.73%	4.18%	3.97%	3.40%	3.89%	3.66%
11 Tobacco	3.75%	4.20%	3.99%	3.09%	3.62%	3.37%
12 Baked items	5.64%	5.88%	5.77%	3.90%	4.34%	4.13%
13 Soft drinks	3.64%	4.11%	3.89%	1.90%	2.57%	2.26%

Source: Authors calculation

due to price changes, by using equivalent income and equivalent variation method. There are considerable differences in the composition of the consumption basket between rich and poor, therefore, the survey data of both years is disaggregated into four sub-samples according to the expenditure levels of rural-urban segments based on head count index. The study divides in to the following sections. After introduction which is presented in section 1 above. Data source and methodological framework are presented in Section 2. Results are discussed in Section 3. Final section concludes the study.

### Data source and methodological framework

The study requires comprehensive data sets on household consumption expenditures. This data is available in Household Integrated Expenditures Survey (HIES), conducted by Federal Bureau of Statistics, Government of Pakistan. The published form of HIES data gives the information in groups form, such as expenditure made by entire group on the consumption of a particular commodity group, but for our analysis we need grass root level information of each household. Therefore instead of relying on published we have used micro level data of HIES. The period of analysis covers two survey years 2001-02 and 2005-06. There is a considerable gap between these two surveys for evaluating the welfare effects of price changes over a significant time.

There are considerable differences in the composition of the consumption basket between rich and poor. Thus, the welfare effect of price changes can not be same for all households so, the survey data of both years is disaggregated into four groups according to the expenditure levels of households. The grouping of households is based on poverty estimates. The present study brings separate poverty lines for rural and urban segments as given by Qureshi and Arif (2001). The poverty lines are inflated for the years 2001-02 and 2005-06. Table 1 gives the estimates of poverty lines.

The households in both survey years have been categorized according to headcount index. First group is comprised up of the poor households. It includes all households whose pre-adult equivalent expenditures are less than poverty line. Second group contains those non-poor households whose per-adult-equivalent expenditure is at most 50% above the poverty line. The per-adult equivalent expenditure of the households in the third group is more than 50% of the poverty line and at most twice the poverty line. The last group includes the households whose per-adult-equivalent expenditures are at least twice the poverty threshold. Table 2 explicates the household

grouping based on headcount indexes.

The distribution of population within rural-urban regions and with respect to poor and non-poor status has been shown in Table 3. In rural segment, the number of poor lying below the poverty line was 1709 during 2001-02. This figure has been increased to 2112 in 2005-06. This clearly shows that the proportion of poor below the poverty line has been increased from 17.09% to 21.62% during 2001-02 and 2005-06 in the rural region. The proportion of household belonging to Group-2 (Marginally Non-Poor) has also been increased from 23.58% to 28.42%. Contrary to it the proportion of Group-3 and group-4 (middle class and rich class) is squeezed from 20.87% and 38.45% to 20.84% and 27.78% respectively.

Same sort of scenario is also observed in urban region. The magnitude of poor population has been increased from 29.63% to 38.30%. An increment in the proportion of middle class has been observed though marginally. The statistics show that the percentage of middle class has been increased from 18.94% to 19.88%, while rich class has been declined by 3.81%. The distribution of total population within household groups shows that the Group-1 is comprised up of 26.30% of total population for 2005-06. This shows that the 26.30% of total population is lying below the poverty line while this number was 22% for 2001-02. The proportion of households that are marginally poor is also increased from 26.74% to 30.90%. The size of middle class and rich class has been declined from 20.12% to and 19.98% to 31.52% respectively.

The prime objective of this study is to analysis the welfare effects of increase in food prices. Since all food products are neither equally important nor their prices change by same proportion. Therefore, the present study carries out the analysis by classifying the food commodities in various groups. In specific food items have been classified into thirteen groups which shown in Table 4. Cereals, pulses, dairy products, edible oil, fruits and vegetables, spices and condiments, gur/sugar, tea/coffee, meat, tobacco and readymade food are main food groups as households have a greater share of these food items in the food budget. Table 5 gives the percentage expenditure of household on each food group. Table 5 presents the main household expenditures for various categories of food items across different segments of population. Food consumption pattern shows that rural and urban households spend a larger share of food budget on food item, i.e. cereals, pulses, dairy, vegetable, sugar/gur and edible oils. If we look at the overall food expenditures in Pakistan we notice that cereal and pulses constitute approximately 32.03% of total budget share. All other food items such as tea, tobacco

Table 6. Percentage distribution of household expenditures with respect to household groups on each food category

Food Groups	Regions	2001-02				2004-05			
		Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4
Cereals		16.03	13.53	11.03	8.54	17.15	14.41	11.67	8.93
	Rural Pak.	16.57	13.91	11.25	8.59	17.76	14.84	11.93	9.01
	Urban Pak.	15.55	13.19	10.84	8.49	16.60	14.02	11.44	8.86
Pulses		14.52	12.03	9.54	7.06	14.15	11.65	9.16	6.66
	Rural Pak.	14.96	12.31	9.66	7.01	14.57	11.91	9.25	6.59
	Urban Pak.	14.12	11.78	9.44	7.09	13.78	11.42	9.07	6.72
Dairy		14.57	17.54	20.51	23.47	16.84	19.58	22.32	25.07
	Rural Pak.	15.02	18.18	21.34	24.50	17.44	20.36	23.28	26.20
	Urban Pak.	14.18	16.97	19.77	22.56	16.32	18.90	21.48	24.07
Vegetables		9.39	8.97	8.55	8.13	10.17	9.24	8.31	7.38
	Rural Pak.	9.50	9.05	8.61	8.16	10.33	9.34	8.35	7.36
	Urban Pak.	10.03	9.15	8.50	8.11	9.29	8.90	8.28	7.40
Fats and oil		8.39	7.85	7.30	6.75	9.38	8.83	8.27	7.72
	Rural Pak.	8.44	7.86	7.27	6.69	9.49	8.90	8.31	7.72
	Urban Pak.	8.35	7.84	7.32	6.80	9.28	8.76	8.24	7.72
Spices		3.81	3.63	3.44	3.26	3.67	3.56	3.44	3.32
	Rural Pak.	3.56	3.36	3.17	2.97	3.41	3.29	3.16	3.04
	Urban Pak.	4.04	3.86	3.69	3.51	3.90	3.79	3.68	3.58
Sugar		9.66	8.83	7.99	7.16	8.86	8.25	7.64	7.03
	Rural Pak.	9.79	8.90	8.01	7.12	8.94	8.29	7.64	6.99
	Urban Pak.	9.55	8.76	7.97	7.19	8.80	8.22	7.65	7.07
Tea		3.64	3.39	3.13	2.87	3.32	3.01	2.70	2.39
	Rural Pak.	3.38	3.11	2.83	2.56	3.04	2.71	2.37	2.04
	Urban Pak.	3.88	3.63	3.39	3.15	3.57	3.28	2.99	2.69
Meat		6.83	9.31	11.79	14.27	5.01	7.53	10.04	12.55
	Rural Pak.	6.77	9.41	12.06	14.70	4.84	7.52	10.19	12.87
	Urban Pak.	6.88	9.22	11.56	13.90	5.17	7.54	9.91	12.27
Fruits		2.25	3.12	4.54	5.68	2.04	2.82	4.20	5.28
	Rural Pak.	1.90	2.82	4.33	5.55	1.67	3.38	3.97	5.12
	Urban Pak.	2.57	3.38	4.72	5.80	2.36	3.40	4.40	5.42
Tobacco		4.56	4.18	3.79	3.41	3.96	3.57	3.17	2.78
	Rural Pak.	4.36	3.95	3.54	3.13	3.72	3.30	2.88	2.46
	Urban Pak.	4.74	4.38	4.02	3.65	4.18	3.81	3.43	3.06
Baked items		4.96	5.50	6.03	6.57	2.81	3.69	4.57	5.46
	Rural Pak.	4.79	5.35	5.92	6.49	2.49	3.43	4.37	5.31
	Urban Pak.	5.12	5.62	6.13	6.63	3.09	3.92	4.75	5.59
Soft drinks		3.08	3.62	4.15	4.69	0.93	1.81	2.70	3.58
	Rural Pak.	2.79	3.35	3.92	4.49	0.49	1.43	2.37	3.31
	Urban Pak.	3.35	3.85	4.36	4.86	1.32	2.15	2.98	3.81

Note: Values are given in percentage. Group 1 is comprised up of the poor households. It includes all households whose pre-adult equivalent expenditures are less than poverty line. Second group contains those non-poor households whose per-adult-equivalent expenditure is at most 50% above the poverty line. The per-adult equivalent expenditure of the households in the third group is at most twice the poverty line. The last group includes the households whose per-adult-equivalent expenditures are at least twice the poverty threshold.

and spices contribute least magnitude to the total food expenditures for both rural and urban segments. It can be seen that the expenditures on various food groups has been decreased during the period 2001-02 and 2005-06. The results depicts that during the period (2001-02 and 2005-06) household expenditure fell for pulses, meat, sugar, tea, tobacco, vegetables and fruits, soft drinks, readymade food and fruits. While on the other hand, it has been increased for cereal, dairy product and edible oil for all Pakistan.

Another important aspect is the distribution of consumption expenditures among different household. Rich and poor do not have identical consumption bundles, nor is their proportionate expenditure on each grouping same, as shown in Table 6. For instance the highest share of the rural poorest household is spending on cereal (16.57%), pulses (14.57%), dairy products (17.44%), vegetables (10.33%) and edible oil (9.49%) whereas 8.59%, 6.59%, 26.20%, 7.36% proportion of food expenditure is being spent by the by the rural richest household on cereal, pulses, dairy products, vegetables and edible oil respectively. If we look on the other goods, we see that rural poorest household is spending relatively small proportion of their total expenditure on meat, readymade food items, soft drinks and fruits whereas the proportion of such items in the food budget of rich is quite large. Same is true for the urban segment where the richest are spending more on meat, fruits, readymade food items, soft drinks while poor households are spending more on cereals, pulses, vegetables, dairy products while these items are contributing least in the food budget share of rich households. Thus it appears as households become more affluent their food expenditure on cereal, pulses, dairy products, vegetables and edible oil fall, whereas their expenditure on meat, fruits, readymade food items, soft drinks increases quite significantly.

*Methodology for equivalent income and equivalent variation*

The study employs linear expenditure system to work out Equivalent Income and Equivalent Variation given by Stone (1954). LES direct utility function can be written as:

$$U = \sum_i b_i \log(x_i - g_i) \tag{1}$$

Where  $x_i$  denotes the consumption of the  $i$ th good and  $g_i$  committed consumption, with constraints  $x_i > g_i$ ,  $0 < \beta_i < 1$  and  $\sum_i \beta_i = 1$ .

The Langrang Multiplier of the utility function

subject to budget constraint  $y = \sum_i p_i x_i$  is given by

$$Z = \sum_i b_i \ln(x_i - g_i) + \lambda \left[ y - \sum_i p_i x_i \right] \tag{2}$$

By differentiating eq (2) w.r.t  $x_i$ , we get the linear expenditure function for good  $x_i$

$$p_i x_i = g_i p_i + b_i \left( y - \sum_i p_i g_i \right) \tag{3}$$

By re-arranging eq (3), we get

$$x_i - g_i = \frac{b_i \left( y - \sum_i p_i g_i \right)}{p_i}$$

This can be written in the more succinct form

$$x_i^* = \frac{b_i y^*}{p_i} \tag{4}$$

where  $x_i^* = x_i - g_i$  is the committed consumption. Committed consumption refers to a certain amount of the total income of consumers that is used for acquiring basic goods. The remaining income distributes over the set of available commodities according to respective values of marginal propensities to consume.

By differentiation eq (3) w.r.t,  $p_i$  we get the own price elasticity of demand for the  $i$ th good,  $e_{ii}$

$$e_{ii} = \frac{g_i (1 - b_i)}{x_i} - 1 \tag{5}$$

The cross price elasticity,  $e_{ij}$ , that is the elasticity of demand for good  $i$  in response to a change in the price of good  $j$  can be obtained by differentiating eq (3) w.r.t  $p_j$  and dividing by  $x_i$ , so we get

$$e_{ij} = - \frac{b_i g_j}{x_i} \left( \frac{w_j}{w_i} \right) \tag{6}$$

where the term  $w_i = \frac{p_i x_i}{y}$  is the expenditure or budget share of the  $i$ th commodity. The total expenditure of commodity  $i$ ,  $e_i$  is given by

$$e_i = \frac{b_i g}{p_i x_i} \tag{7}$$

If we utilize the definition of  $w_i = \frac{p_i w_i}{g}$  in eq (7), we can write

$$e_i = \frac{b_i}{w_i} \tag{8}$$

*Estimation for each total expenditure group*

From the household budget data, the expenditure weights or budget shares,  $w_i$ , can be calculated for each commodity group. This can be done from either using the aggregate data by grouping the individual households by income. These weights can be used to find, for each total expenditure group, the set of total expenditure elasticities,  $e_i$  after calculating the  $e_i$ s, the corresponding values of  $w_i$  can be determined by using eq (5), so we get

$$b_i = e_i w_i \tag{9}$$

Another variable important for the application of the model are own-price elasticities. They are necessary for calculation of committed expenditure,  $p_i \gamma_i$ , for each commodity group and total expenditure or income group.

If the value of own price elasticities of demand is available using extraneous information for each good at each income level, then equation (5) can be used for the calculation of committed expenditure,  $p_i \gamma_i$

$$p_i \gamma_i = \frac{w_i (1 + e_i)}{1 - b_i} \tag{10}$$

For LES demand systems to represent the consumption behavior of households, income elasticity of each commodity and Frisch parameter for each household category are crucial. The Frisch parameter is the substitution parameter measuring the sensitivity of the marginal utility to income/total expenditures. The Frisch parameter, also called money flexibility, established a relationship between own-price and income elasticities. if  $\delta_{ij}$  denotes the Kronecker delta, such that  $\delta_{ij} = 0$  when  $i \neq j$ , and  $\delta_{ij} = 1$  when  $i = j$ , then Frisch showed that the elasticities can be written as

$$e_i = -e_i w_j \left( 1 + \frac{e_j}{x} \right) + \frac{e_i d_j}{x} \tag{11}$$

so that own-price elasticities are

$$e_i = e_i \left\{ \frac{1}{x} - w_i \left( 1 + \frac{e_i}{x} \right) \right\} \tag{12}$$

The use of equation (11) ensures that all additivity and homogeneity restrictions are satisfied.

*Welfare effects*

$\beta_i$  and  $p_i \gamma_i$  estimated so far are necessary tools for obtaining the welfare effects of inflation, assuming that all consumers face same prices. The present study determines these effects by calculating compensating and equivalent variations, and equivalent incomes.

This study considers the welfare effects of food inflation in two ways. First, it examines the own price elasticities and cross price elasticities resulting from annual price changes. Secondly, values of measure of welfare are reported. The welfare measure is based on the distribution of “Equivalent Variation” and “Equivalent income”, following the concept explored in detail by Creedy (1999). The first stage in calculating the price elasticities for each total expenditure level requires information about the way in which the  $w_i$ s and  $e_i$ s vary with income.

The income and total expenditure elasticities are directly obtained from the household budget data. The income and total expenditure elasticities can be expressed in terms of changes in expenditure weights. Using the basic definition  $w_i = \frac{p_i x_i}{y}$  differentiation gives

$$\dot{w}_i = \dot{y} (e_i - 1) \tag{13}$$

Where  $\dot{w}_i$  denotes the proportional change in the expenditure weights on the  $i$ th commodity,  $dw_i/w_i$  resulting from the proportional change in total expenditure,  $dy/y = y$  rearranging eq (13), we get

$$e_i = 1 + \frac{\dot{w}_i}{y}$$

Form budget data it is possible to calculate the average expenditure weights for each commodity group. These weights can be arranged in the form of a matrix with  $K$  rows and  $n$  columns. Denote the midpoints of the  $K$  total expenditure groups by  $y_k (k = 1, \dots, K)$  and the expenditure weights of the  $i$ th commodity group and the  $k$ th total expenditure group by  $w_{ki} (i = 1, \dots, n)$

Define the following proportionate changes for  $k = 2, \dots, K$

$$\dot{y}_k = \left( \frac{y_{k-1}}{y_k} \right) - 1 \tag{14}$$

$$\dot{w}_{ki} = \left( \frac{w_{k-1,i}}{w_{ki}} \right) - 1 \tag{15}$$

Although the dot notation has been used the above proportionate changes are discrete changes obtained by comparing the values in adjacent total expenditure groups.

Similarly, for  $k = 1, \dots, K - 1$  define the proportionate changes

$$\dot{y}_k^* = \left( \frac{y_{k+1}}{y_k} \right) - 1 \tag{16}$$

$$\dot{w}_k^* = \left( \frac{w_{k+1}}{w_k} \right) - 1 \tag{17}$$

These are then used to substitute in the equation (2) to get the set of total expenditure elasticities which are as follow:

$$e_{i(k)}' = 1 + \frac{w_k'}{y_k}$$

$$\dot{y}_k^* = \left( \frac{y_{k+1}}{y_k} \right) - 1 \tag{18}$$

$$e_{i(k)}^* = 1 + \frac{\dot{w}_k^*}{y_k^*} \tag{19}$$

*The expenditure function*

The first stage is to obtain expenditure function. Derivation of the expenditure function begins from indirect utility function,  $V(p,y)$ , which expresses utility as a function of prices and income. It is obtained by substituting the demand functions in to the utility function.

So substitute equation (6) in equation (1), we get

$$V = \sum_i b_i \log \left( \frac{b_i y^*}{p_i} \right) \tag{20}$$

Using  $\sum_i b_i = 1$ , above equation can be written as

$$V = \log \left\{ y^* \prod_i \left( \frac{b_i}{p_i} \right)^{b_i} \right\} \tag{21}$$

Using the monotonic transformation property of the indirect utility function, we get

$$V^* = y^* \prod_i \left( \frac{b_i}{p_i} \right)^{b_i} \tag{22}$$

Putting the  $y^* = y - \sum_j p_j g_j$  in eq (22), we get

$$V^* = \left( \frac{y - A}{B} \right) \tag{23}$$

where  $A = \sum_i p_i g_i$  and  $B = \prod_i \left( \frac{p_i}{b_i} \right)^{b_i}$

The expenditure function presents the minimum expenditure required to achieve U at prices p, written as  $E(p,U)$

It is given by rearranging equation (23) to give

$$E(p,U) = A + B^U \tag{24}$$

*Equivalent variation*

The equivalent variation, EV, is the difference between the total expenditure level after change of prices and the minimum expenditure required to achieve utility after change of prices at the pre-change prices. It is given by

$$EV = E(p_1, U_1) - E(p_o, U_1) \tag{25}$$

This can be written as

$$EV = y_1 - (A_o + B_o U_1) \tag{26}$$

Substituting for  $U_1 = \left( \frac{y_1 - A_1}{B_1} \right)$  into equation (26) and rearranging gives

$$EV = y_1 - A_o \left[ 1 + \frac{B_o}{B_1} \left( \frac{y_1 - A_1}{A_o} - \frac{A_1}{A_o} \right) \right] \tag{27}$$

The term  $\frac{A_1}{A_o}$  is equal to  $\frac{\sum_i p_i g_i}{\sum_i p_o g_i}$  and is therefore a Laspeyres type of price index, using the committed consumption of each good as the weight. For this reason it is sometimes referred to as a price index of "necessities".

Since actual prices are not usually available, it is necessary to covert this form of the price index into one involving only proportional changes in prices. If  $p_i^*$  denotes the proportional change in the price of the *ith* good, then  $p_{1i} = p_{oi} (1 + p_i^*)$  and

$$\frac{A_1}{A_o} = 1 + \sum_i s_i p_i^* \tag{28}$$

Where the term  $s_i$  is defined as  $s_i = \frac{p_o g_i}{\sum_i p_o g_i}$

The term  $\frac{B_1}{B_o}$  in eq (27) simplifies to

$$\frac{B_1}{B_o} = \prod_i \left( \frac{p_{1i}}{p_{oi}} \right)^{b_i} \tag{29}$$

Eq (29) can be expressed in terms of proportionate changes, so the eq (29) becomes

$$\frac{B_1}{B_0} = \prod_i (1 + p_i^*)^{\beta_i} \quad (30)$$

*Equivalent incomes*

Equivalent income is defined as the value of income,  $y_c$  which at some reference set of prices,  $p_r$  gives the same level of utility as the actual income level. Therefore  $y_c$  is given by

$$V(p_r, y_c) = V(p, y) \quad (31)$$

Using the expenditure or cost function gives

$$y_c = E(p_r, V(p, y)) \quad (32)$$

This may be written as

$$y_e = F(p_c, p, y) \quad (33)$$

Where F is referred to as equivalent income function. For the linear expenditure system, this can be obtained using equations (23) and (24). The actual utility,  $u$ , can be expressed from the indirect utility function as  $(\frac{y-A}{B})$ . The minimum expenditure required to achieve this utility level, at the reference set of prices, is given by

$$y_e = A_r + \frac{B_r(y-A)}{B} \quad (34)$$

Expanding the terms A and B in eq (34) gives

$$y_e = \sum_i p_i g_i + \left\{ \prod_i \left( \frac{p_i}{p_i} \right)^{\beta_i} \right\} \left\{ y - \sum_i p_i g_i \right\} \quad (35)$$

The indices zero and one refer to pre-change and post-change values respectively. The equivalent income function ensures that alternative tax policy are evaluated using a common set of reference prices. Consider the use of pre-change prices as reference prices so that  $p_{ri} = p_{oi}$  for all  $i$  substituting into equation (35) shows that pre-change equivalent incomes are the actual income, and thus  $y_e = y$ . Thus the equivalent income after the change in the tax structure are given by

$$y_e = \sum_i p_{oi} g_i + \left\{ \prod_i \left( \frac{p_{oi}}{p_{oi}} \right)^{\beta_i} \right\} \left\{ y_1 - \sum_i p_{oi} g_i \right\} \quad (36)$$

This can be written as

$$y_e = A_o \left[ 1 + \frac{B_o}{B_1} \left( \frac{y_o}{A_o} - \frac{A_1}{A_o} \right) \right] \quad (37)$$

## Results and Discussion

### *Estimates of price and expenditure elasticities*

The price elasticities indicate the degree of responsiveness of demand due to a given price change. Table 7 shows the own price elasticities for food items across the rural-urban regions in Pakistan. The results indicate that all own price elasticities are negative for both period of analysis. It implies that all commodities are normal for every income group and there exists an inverse relationship between changes in own-price indexes and quantity demanded. The results reveal that values of own price elasticities ranges from 0.018 to 0.193 in absolute term.

In general the own price elasticities are very low for cereals, pulses, dairy and vegetables for the poorest group while the own price elasticities of such commodities are relatively high for the other income groups for the both periods. On the other hand the own price elasticities for edible oil, sugar, meat, fruits, readymade food, soft drinks are high for all income groups. Spices are the only commodity showing moderate own price elasticities for the poorest income group only for year 2001-02 but relatively high as compare to the other income groups. Similarly the own price elasticities for tea and tobacco are high for the income group which is below the poverty line and relatively low for marginally poor income group, middle class and the richest class of the society.

The results suggest that the increase in the prices of food items during 2001-02 and 2005-06 significantly reduced the purchasing power of people across the country. As shown in the Table 7, the demand elasticities for pulses have been increased in rural as well as in urban segment. On the other hand the demand elasticities for cereals and dairy products is lower for 2005-06 as compare to 2001-02. It is quite interesting to see that the elasticities for meat and soft drinks almost remained the same for poor and rich, on the other hand it has decreased for the middle class. Similarly the own price elasticity for sugar has been increased for the poor households while it almost remains the same in middle and rich families.

The results also indicate that the effect of increase in the price of staple food items has almost same effect across the rural-urban region. The own price elasticity of cereal and pulses is more for the urban poor than the rural poor, though this difference is insignificant. The own price elasticity for fruits and dairy products are higher for rural households while for vegetables it is high in the case of urban households. Meat and ready-made food products generally have higher price elasticities in absolute

Table 7. Own price elasticities in pakistan, by regions in 2001-02 and 2005-06

Food Groups	Regions	2001-02				2005-06			
		Group1	Group2	Group3	Group4	Group1	Group2	Group3	Group4
Cereals		-0.0282	-0.0989	-0.0976	-0.0901	-0.0301	-0.088	-0.0992	-0.0921
	Rural Pak.	-0.0181	-0.0888	-0.0884	-0.0907	-0.0213	-0.0897	-0.09	-0.0927
	Urban Pak.	-0.035	-0.0856	-0.087	-0.0866	-0.0392	-0.0899	-0.0886	-0.0916
Pulses		-0.0321	-0.1135	-0.1214	-0.1308	-0.0528	-0.1186	-0.1276	-0.1376
	Rural Pak.	-0.0329	-0.1153	-0.1234	-0.1334	-0.0535	-0.1205	-0.13	-0.1406
	Urban Pak.	-0.0407	-0.112	-0.1195	-0.1285	-0.0549	-0.1189	-0.1254	-0.1349
Dairy		-0.0535	-0.077	-0.0796	-0.0904	-0.027	-0.0998	-0.0931	-0.0933
	Rural Pak.	-0.0504	-0.077	-0.0794	-0.0902	0.0483	-0.0937	-0.0952	-0.0941
	Urban Pak.	-0.0561	-0.0721	-0.0787	-0.0805	-0.0208	-0.0932	-0.0918	-0.0927
Vegetables		-0.0668	-0.0834	-0.0855	-0.0877	-0.0436	-0.0834	-0.0853	-0.088
	Rural Pak.	-0.0642	-0.0833	-0.0855	-0.0878	-0.0386	-0.0842	-0.0857	-0.0883
	Urban Pak.	-0.0671	-0.0835	-0.0855	-0.0876	-0.0474	-0.0829	-0.085	-0.0877
Fats and oil		-0.0856	-0.0813	-0.0794	-0.0755	-0.1	-0.0863	-0.0835	-0.0806
	Rural Pak.	-0.0882	-0.081	-0.0779	-0.0748	-0.1008	-0.0863	-0.0833	-0.0802
	Urban Pak.	-0.0951	-0.0816	-0.0789	-0.0762	-0.0992	-0.0863	-0.0836	-0.0809
Spices		-0.0714	-0.0638	-0.0628	-0.0618	-0.0655	-0.0647	-0.0641	-0.0635
	Rural Pak.	-0.0706	-0.0622	-0.061	-0.0599	-0.0695	-0.0632	-0.0625	-0.0619
	Urban Pak.	-0.0721	-0.063	-0.0644	-0.0634	-0.0704	-0.0661	-0.0655	-0.065
Sugar		-0.0983	-0.0827	-0.0795	-0.0763	-0.1039	-0.0834	-0.079	-0.0744
	Rural Pak.	-0.089	-0.0825	-0.0791	-0.0756	-0.105	-0.0833	-0.0785	-0.0736
	Urban Pak.	-0.0976	-0.0829	-0.08	-0.0769	-0.103	-0.0836	-0.0794	-0.0751
Tea		-0.072	-0.0611	-0.0596	-0.058	-0.0719	-0.0577	-0.0556	-0.0534
	Rural Pak.	-0.0713	-0.0591	-0.0574	-0.0556	-0.0714	-0.0552	-0.0528	-0.05
	Urban Pak.	-0.0726	-0.0598	-0.0515	-0.05	-0.0724	-0.0588	-0.0579	-0.055
Meat		-0.1368	-0.0855	-0.0709	-0.0545	-0.1371	-0.0833	-0.0695	-0.0514
	Rural Pak.	-0.1417	-0.0857	-0.0701	-0.0523	-0.1402	-0.0833	-0.0674	-0.0488
	Urban Pak.	-0.1368	-0.0853	-0.0717	-0.0564	-0.1345	-0.0833	-0.0694	-0.0536
Fruits		-0.1516	-0.0865	-0.0812	-0.0846	-0.145	-0.0937	-0.0797	-0.0645
	Rural Pak.	-0.1566	-0.0974	-0.0811	-0.0833	-0.1486	-0.0944	-0.0795	-0.0632
	Urban Pak.	-0.1481	-0.0867	-0.0813	-0.0857	-0.1419	-0.0931	-0.0799	-0.0657
Tobacco		-0.0778	-0.0635	-0.0612	-0.0588	-0.0756	-0.0596	-0.0571	-0.0543
	Rural Pak.	-0.0773	-0.0617	-0.0592	-0.0565	-0.0752	-0.0574	-0.0545	-0.0513
	Urban Pak.	-0.078	-0.065	-0.0599	-0.0608	-0.0759	-0.0615	-0.0592	-0.0568
Baked items		-0.0955	-0.155	-0.1679	-0.1811	-0.1094	-0.1623	-0.1744	-0.1888
	Rural Pak.	-0.0964	-0.1591	-0.1729	-0.1869	-0.1112	-0.1669	-0.1799	-0.1931
	Urban Pak.	-0.0948	-0.1513	-0.1635	-0.1759	-0.1079	-0.1591	-0.1696	-0.1812
Soft drinks		-0.0804	-0.0796	-0.0796	-0.0535	-0.0833	-0.0831	-0.0771	-0.0727
	Rural Pak.	-0.0802	-0.0794	-0.077	-0.0504	-0.0841	-0.0832	-0.0868	-0.0883
	Urban Pak.	-0.0805	-0.0787	-0.077	-0.0561	-0.0827	-0.0818	-0.0937	-0.0906

Source: Authors calculation

terms for rural households than the urban households. On the other hand the own price elasticities for edible oil and readymade food items increases more sharply for rural households than urban households with the increase in the income.

The own price elasticities for staple food items like cereals, pulses and dairy products is lower for rural poor than the rural rich households. A low price elasticity of demand means that even if prices increases substantially, people will not decrease their consumption of such food items by much. Fruits have much higher own price elasticities than vegetables for rural poor. For vegetables own price elasticity declines marginally with income. Fruits demand elasticities decline more sharply. Meat, soft drinks and ready-made food products generally have higher price elasticities in absolute terms among for rural poorest households than the rural rich. On the other hand, the own price elasticities for edible oil, tea, spices, sugar and tobacco are low for higher income groups.

In absolute terms the price elasticities for cereals, pulses and dairy products are higher for urban rich as compare to urban poor. It indicates that cereals, pulses and dairy products constitute the diet of poor households in the urban sector also. On the other hand, the own price elasticities for fruits, readymade items, meats and soft drinks increases with the increase in income. Price elasticities for vegetables decline marginally with income. Meat, soft drinks and ready-made food products generally have higher price elasticities in absolute terms among for rural poorest households than the rural rich. On the other hand, the own price elasticities for edible oil, tea, spices, sugar and tobacco marginally decrease with the increase in income.

The expenditure elasticities indicate the degree of responsiveness of demand due to a given change in income. Table 8 shows the expenditure elasticities for food items across the rural-urban regions in Pakistan. All expenditure elasticities are positive for both period of analysis. It shows that all commodities are normal for all income groups and there exists a positive relationship between in income and quantity demanded. The results reveal that the values of expenditure elasticities range from 0.0251 to 0.8289. It is also interesting to note that the expenditure elasticities are greater in magnitude as compare to own price elasticities.

Table 8 indicates that expenditure elasticities for cereal and pulses are high for the poorest income group while it is low for the rest of the income groups for both periods of analysis. Contrary to it dairy products have low expenditure elasticities for poorest

Table 8. food expenditure elasticities in pakistan, by regions in 2001-02 and 2005-06

Food Groups	Regions	2001-02				2005-06			
		Group1	Group2	Group3	Group4	Group1	Group2	Group3	Group4
Cereals		0.5798	0.405	0.3927	0.3468	0.5779	0.4078	0.3895	0.3538
	Rural Pak.	0.5921	0.4018	0.3778	0.3383	0.5802	0.4045	0.3815	0.3463
	Urban Pak.	0.5777	0.408	0.3873	0.3544	0.5756	0.4109	0.3915	0.3614
Pulses		0.5957	0.3995	0.3997	0.3238	0.5892	0.3929	0.3837	0.3125
	Rural Pak.	0.5995	0.3924	0.3829	0.3112	0.5912	0.3894	0.3765	0.2983
	Urban Pak.	0.5893	0.4005	0.3793	0.3348	0.5854	0.3971	0.3703	0.3249
Dairy		0.3982	0.5846	0.5723	0.5632	0.4186	0.57	0.5614	0.5547
	Rural Pak.	0.3948	0.5889	0.574	0.5645	0.4163	0.5717	0.5627	0.5557
	Urban Pak.	0.4014	0.5824	0.5707	0.5619	0.4206	0.5683	0.5601	0.5537
Vegetables		0.5724	0.4766	0.4765	0.4742	0.5456	0.4488	0.4441	0.4371
	Rural Pak.	0.5736	0.4763	0.474	0.4726	0.5479	0.4471	0.4426	0.4328
	Urban Pak.	0.5213	0.4778	0.4787	0.4756	0.5436	0.4522	0.4471	0.4409
Fats and oil		0.5326	0.5295	0.4651	0.4887	0.4625	0.4886	0.4594	0.4642
	Rural Pak.	0.5346	0.531	0.4638	0.4899	0.4592	0.4846	0.4554	0.4619
	Urban Pak.	0.5338	0.5281	0.467	0.4703	0.4647	0.4894	0.462	0.4602
Spices		0.5242	0.4745	0.4722	0.4716	0.5157	0.4838	0.4832	0.4827
	Rural Pak.	0.5276	0.4707	0.4693	0.4699	0.516	0.4813	0.4826	0.4798
	Urban Pak.	0.5216	0.4774	0.4784	0.4752	0.5139	0.4857	0.4853	0.4848
Sugar		0.5344	0.463	0.46	0.4566	0.5432	0.4527	0.4478	0.4417
	Rural Pak.	0.5364	0.4638	0.4574	0.4535	0.5454	0.4501	0.4445	0.4376
	Urban Pak.	0.5327	0.465	0.4624	0.4593	0.5412	0.4551	0.4507	0.4453
Tea		0.5392	0.4621	0.459	0.4553	0.547	0.4481	0.4421	0.4345
	Rural Pak.	0.5405	0.456	0.4517	0.4486	0.5548	0.4385	0.4329	0.4184
	Urban Pak.	0.5312	0.4667	0.4643	0.4616	0.5412	0.4551	0.4507	0.4452
Meat		0.2484	0.6669	0.6251	0.6001	0.3181	0.6334	0.6053	0.587
	Rural Pak.	0.2236	0.678	0.6313	0.604	0.3047	0.6305	0.6027	0.58
	Urban Pak.	0.2709	0.6571	0.6195	0.5995	0.3268	0.627	0.6013	0.5842
Fruits		0.2361	0.6732	0.6286	0.6023	0.2464	0.6882	0.6259	0.6006
	Rural Pak.	0.1557	0.7039	0.6448	0.6123	0.1797	0.6982	0.6404	0.6097
	Urban Pak.	0.2847	0.6505	0.6157	0.5939	0.2801	0.6478	0.6141	0.5929
Tobacco		0.5422	0.4593	0.4492	0.4435	0.5487	0.4448	0.4373	0.4291
	Rural Pak.	0.547	0.4481	0.4421	0.4345	0.5524	0.4394	0.4272	0.4147
	Urban Pak.	0.5383	0.4586	0.4543	0.4473	0.5444	0.4512	0.4445	0.4384
Bakery/Items		0.4461	0.5467	0.5443	0.5407	0.3427	0.6196	0.5995	0.581
	Rural Pak.	0.4405	0.5532	0.5481	0.5439	0.3111	0.6371	0.6076	0.5886
	Urban Pak.	0.4508	0.5448	0.5411	0.538	0.3652	0.6061	0.6076	0.5745
Soft drinks		0.4133	0.5739	0.5684	0.557	0.0251	0.7436	0.6636	0.6294
	Rural Pak.	0.3977	0.5849	0.5776	0.5634	0.4524	0.6287	0.6284	0.6142
	Urban Pak.	0.4247	0.5654	0.5578	0.5518	0.1845	0.6935	0.6395	0.6091

Source: Authors calculation

income group while high for the other income groups. Vegetables and spices expenditure elasticities are high for the poorest income group for the year 2001-02 and moderate for rest of the income groups. Similarly the expenditure elasticities for sugar, tea, and tobacco is high for the group which is below the poverty line and low for the higher income groups for the both period of analysis while meat, fruits, readymade food items and soft drinks show the opposite pattern.

It can be examined from the Table 8 that the increase in the prices of food items during 2001-02 and 2005-06 has considerably affected the

expenditure pattern of the people all over the country. The results indicate that the expenditure elasticities for pulses and cereals have been increased only for the poorest income group while it remained low for the higher income groups. A low expenditure elasticity of demand for rich household means that, as family incomes increase, consumption of that commodity will not grow very much. Similarly the expenditure elasticities of dairy have shown an increasing pattern for below poverty, marginally poor and the middle income group while remains low for the richest income group. Expenditure elasticities of edible oil and spices remained low poorest as well as richest income groups. Tobacco, tea and sugar are the commodities for which the expenditure elasticities have shown an increasing pattern only for the poorest and richest groups. The expenditure elasticities for meat, soft drinks, readymade food and fruits are higher for the poorest households than the other income groups.

The results also reveal that the increase in the prices of staple food items almost has the same effect across the rural-urban region. Though this difference is insignificant but the expenditure elasticities for cereal and pulses are relatively more for the urban households than the rural ones. The expenditure elasticity for fruits and dairy products are higher for urban households while own price elasticity for vegetables are high for rural households. The expenditure elasticities for staple food items like cereals, pulses and dairy products are lower for the richest income group. This finding shows that these commodities are less important for higher income groups because higher income households can consume more substitutes. Vegetables have much higher expenditure elasticities than fruits for rural poor as compare to rural rich. The absolute value of expenditure elasticity for vegetable decreases significantly with the increase in income. Fruits expenditure elasticity increases with the increase in income. Meat and ready-made food products generally have higher expenditure elasticities among urban households than the rural households. On the other hand, the demand for edible oil and sugar is higher for rural households than urban households. The expenditure elasticities for cereals, pulses and dairy products are higher for urban poor than urban rich. On the other hand the expenditure elasticities for fruits, readymade food items, meats and soft drinks are higher for rich households. A poor family will spend most of any additional income on low value food items, and decreases in such food prices will increase its food purchases substantially. In the case of rich households, changes in income

Table 9. Equivalent variation and equivalent income implied by the price changes: rural

CONSUMPTION GROUPS	GROUP 1		GROUP 2		GROUP 3		GROUP 4	
	EQUIVALENT VARIATION	EQUIVALENT INCOME						
CEREALS	11.52%	14.52%	7.07%	8.47%	4.01%	4.59%	2.02%	2.22%
PULSES	12.70%	15.19%	7.64%	8.77%	4.18%	4.70%	2.03%	2.22%
DAIRY	17.72%	18.51%	19.83%	20.68%	22.41%	22.86%	25.14%	25.03%
VEGETABLES	4.71%	4.97%	2.81%	3.11%	1.73%	1.92%	1.00%	1.12%
EDIBLE OIL	4.86%	5.19%	3.10%	3.29%	1.94%	2.04%	1.16%	1.21%
SPICES	1.61%	1.70%	1.07%	1.12%	0.70%	0.73%	0.43%	0.45%
SUGAR	3.28%	3.51%	2.03%	2.20%	1.25%	1.35%	0.73%	0.79%
TEA	1.26%	1.34%	0.80%	0.85%	0.49%	0.52%	0.29%	0.31%
MEAT	3.56%	3.54%	3.37%	3.42%	2.87%	2.97%	2.23%	2.36%
FRUITS	1.08%	1.10%	1.10%	1.13%	0.99%	1.02%	0.80%	0.83%
TOBACCO	2.54%	2.69%	2.59%	2.72%	2.65%	2.76%	2.70%	2.79%
READYMADE ITEMS	1.61%	1.85%	1.75%	1.94%	1.60%	1.76%	1.31%	1.44%
SOFT DRINKS	2.26%	2.54%	1.97%	2.13%	1.61%	1.74%	1.24%	1.32%

Source: Authors calculation

Table 10. Equivalent variation and equivalent income implied by the price change: urban

CONSUMPTION GROUPS	GROUP 1		GROUP 2		GROUP 3		GROUP 4	
	EQUIVALENT VARIATION	EQUIVALENT INCOME						
CEREALS	25.49%	31.54%	23.24%	26.05%	19.43%	20.55%	14.72%	15.06%
PULSES	27.90%	32.72%	24.75%	26.87%	13.43%	12.85%	14.73%	15.18%
DAIRY	8.28%	8.93%	6.02%	6.90%	4.36%	5.19%	3.01%	3.71%
VEGETABLES	9.71%	10.02%	8.70%	9.22%	8.01%	8.41%	7.20%	7.61%
EDIBLE OIL	10.00%	10.47%	9.56%	9.68%	8.98%	8.90%	8.30%	8.11%
SPICES	3.36%	3.51%	3.28%	3.35%	3.16%	3.20%	3.03%	3.04%
SUGAR	6.82%	7.14%	6.29%	6.53%	5.79%	5.91%	5.22%	5.30%
TEA	2.65%	2.77%	2.44%	2.54%	2.23%	2.31%	2.02%	2.08%
MEAT	7.38%	7.18%	10.37%	10.01%	19.97%	21.03%	16.62%	15.68%
FRUITS	2.26%	2.28%	3.37%	3.38%	4.49%	4.48%	5.63%	5.58%
TOBACCO	1.21%	1.29%	0.85%	0.91%	0.59%	0.62%	0.39%	0.41%
READYMADE ITEMS	3.38%	3.87%	5.35%	5.81%	7.27%	7.76%	9.27%	9.70%
SOFT DRINKS	4.71%	5.12%	5.95%	6.39%	7.25%	7.67%	8.64%	8.94%

Source: Authors calculation

or food prices of low value food items affect food consumption very little. The expenditure elasticities for vegetables decline significantly with income. The expenditure elasticities for edible oil, tea, spices, sugar and tobacco also decreases with the increase in the income. While the expenditure elasticities for fruits, meat, soft drinks and ready-made food products increases with the increase in income more extensively.

As discussed earlier, the prices of many food items in the household food consumption basket increased significantly between 2001-02 and 2005-06. These increases have the significant effect by lowering the purchasing power of households across the country, resulting into an economic welfare loss. Therefore, it is necessary to quantify the welfare loss with accurate measures. For that reason, the study employs the income and equivalent variations to measure loss of household welfare due to price change. Hence, the welfare effects of price changes shall be explored in the next section.

#### Price changes and the consumer welfare

The estimated elasticities are used to assess the

welfare consequences of the food price changes that occurred between 2001-02 and 2005-06. Following some recent literature [see Creedy (1998), Ackah and Appleton (2005), Drezgie (2008)], we estimated the change in consumer welfare, measured as equivalent variation (EV) and equivalent income (IV) as a percentage of their post price total expenditure. In doing this, we also recognized the importance of determining how different population groups are affected in different way by their price changes. Thus, to illustrate which group of households was relatively disadvantaged by the price changes, we disaggregated the equivalent variation (EV) and income variation (IV) measure by income groups and regions.

Welfare changes for the change in the price of cereals, pulses, meat, dairy products, edible oil, vegetables, fruits, spices, sugar, tea, tobacco, readymade food and soft drinks for the rural and urban segments in terms of equivalent income and equivalent variation are presented in Table 9 and Table 10 respectively. The results clearly show that on average absolute loss is larger for poor households than the rich households in both rural-urban segments. Results also reveal that the welfare loss in terms of

Table 11. Equivalent variation and equivalent income implied by the price changes: Pakistan

CONSUMPTION GROUPS	GROUP 1		GROUP 2		GROUP 3		GROUP 4	
	EQUIVALENT VARIATION	EQUIVALENT INCOME						
CEREALS	17.91%	21.68%	10.53%	12.26%	5.75%	6.48%	2.80%	3.05%
PULSES	19.60%	22.83%	11.31%	12.82%	5.99%	6.65%	2.82%	3.06%
DAIRY	12.64%	13.46%	8.93%	10.06%	6.26%	7.38%	4.19%	5.17%
VEGETABLES	7.07%	7.30%	4.10%	4.47%	2.45%	2.70%	1.38%	1.55%
EDIBLE OIL	7.28%	7.63%	4.52%	4.73%	2.76%	2.87%	1.60%	1.66%
SPICES	2.41%	2.51%	1.56%	1.62%	0.99%	1.02%	0.60%	0.62%
SUGAR	4.94%	5.11%	2.97%	3.14%	1.77%	1.88%	1.01%	1.07%
TEA	1.89%	1.98%	1.16%	1.22%	0.70%	0.74%	0.40%	0.42%
MEAT	5.78%	5.45%	7.57%	7.41%	12.08%	12.32%	9.17%	9.53%
FRUITS	4.90%	4.97%	4.89%	4.97%	1.51%	1.55%	1.37%	1.42%
TOBACCO	5.42%	5.75%	3.69%	3.93%	2.49%	2.63%	1.61%	1.69%
READYMADE ITEMS	7.21%	8.17%	7.61%	8.26%	6.77%	7.29%	5.41%	5.78%
SOFT DRINKS	10.04%	11.35%	8.51%	9.19%	6.81%	7.30%	5.11%	5.44%

Source: Authors calculation

equivalent income is larger than that of equivalent variation except in a few cases of meat, fruits and edible oil.

Table 9 shows that in rural segment dairy products contribute the largest magnitude of welfare loss for all income groups. In terms of equivalent income as well as equivalent variation. Similarly for urban segment this magnitude is higher for pulses in the case of the poorest and the marginally poor income group. On the other hand for middle and the richest class the prime commodity of welfare loss is meat. The welfare loss is smaller for fruits for the poorest income group as compare to the rest of the commodities and tea for the higher income groups in rural region. While, tobacco constitutes least welfare loss for all income groups in urban segment.

The results also reveal that the welfare loss for spices, tea, meat, fruit, tobacco, readymade food items and soft drinks has almost same effect across the various income groups of rural segment. Similarly the welfare loss of edible oil, spices, sugar, tea, readymade items and tobacco is approximately same among all income groups for urban region. The urban households need to be compensated more due to the price changes of cereal, pulses, vegetables, spices, sugar, tea, meat, readymade food, soft drinks and fruits than the rural ones. It is also obvious that this disparity is quite significant for cereals, pulses, edible oil, sugar and meat. The welfare loss for dairy products is higher for rural households while it is higher for vegetables in the case of urban households.

The rural poor need more compensation for cereals, pulses, vegetables and edible oil. However, the welfare loss for the middle and the upper class is more pronounced in the context of dairy products and tobacco. Fruits have much higher value of welfare loss than vegetables for rural poor as well as rural rich. The values of EI and EV for vegetables decline more sharply with income. Such values also decline

for fruits with the increase in income but less than vegetables.

It can be noted from Table 10 that the increase in the prices of cereals, pulses, sugar, edible oil and dairy products affected the urban poor more as compare to urban rich. On the other hand the welfare loss meat, fruits, readymade food items and soft drinks is higher for the higher income groups. The values of EI and EV decline with the increase in the income. The results of Table 11 show that the welfare loss of tea has almost same effect across the various income groups. The poor households need to be compensated more due to the price changes of cereal, pulses, dairy, edible oil and vegetables than the rich ones. It is also apparent that this disparity is quite significant for cereals, pulses, and dairy products. The welfare loss for pulses is higher for poor households while it is higher for meat in the case of rich households. Fruits have much higher value of welfare loss than vegetables for rich.

#### *Reasons of increased food prices from 2001-02 to 2005-06*

The price of wheat, in particular, is very important as it not only directly pushes up the food inflation but also contributes to a strengthening of inflationary expectations in the economy. The sharp jump in the wheat (and derivative product) prices were an important element in igniting food inflation in the domestic economy. Initially it was anticipated that the price hike at the beginning of 2004 would fade away, following the normalization of wheat supply due to imports and the arrival of new crop. However as the crop proved to be below expectation, imports failed to materialize and government reserves were inadequate to dampen speculative pressures. The resulting hike in wheat product prices, through its impact on expectations, probably contributed significantly to the rise in prices of other food staples, and consequently

on food inflation. The rise in wheat prices probably contributed significantly to an increase in inflationary expectations that, together with rising transportation costs and higher export prices.

The increase in the price of pulses was because of the shortage in pulses and gram during 2000 due to dry weather and huge demand which put upward pressure on the prices of pulses. High petroleum prices (affecting the price of fertilizer and transport costs), disruptive weather patterns negatively affecting harvests in several regions, hoarding by speculating millers and retailers were other domination factors contributing to increased price of pulses.

Due to the rupee devaluation by 18.6 percent against the US dollar during 2000-01, imports became much expensive. The import unit value index of many groups recorded substantial increases, e.g. 16.5 percent petroleum products and 21.7 percent in sugar. This is evident that in a rise of sugar crisis sugar mills reduced sales of stocks in order to maintain higher than equilibrium prices. The price of sugar also began to spiral up due to the short inventory and decline in sugarcane crops. However, the improvement in stock through gradual import kept the domestic prices of sugar increasing in the domestic market.

The prices of palm oil increased in the international market during 2001-02. Consequent to the increase in international palm oil prices, domestic prices of ghee and cooking oil also followed some increasing trend. The average price of palm oil in the international market was higher by 59.9 percent in June 2002 over the corresponding period in 2001. The surge was due to the low stocks, falling production and higher demand and heavy purchases by India, China and certain other countries. The subsequent increase in the import palm oil and fall in the domestic production of vegetable ghee put pressure on the prices of vegetable ghee and cooking oil. Substantial increase in the price of cotton seed oil which together with the increase in the rate of surcharges on gas, petroleum and electricity, steady rise in indirect taxes on various goods and services in the budget 2002-03 were important contributors to the higher prices of ghee and cooking oil. Similarly high taxation in the form of excise duty and sale taxes also accelerated an upward price movement on tobacco products.

A significant rise of milk prices in 2004 over 2003 pushed up the CPI inflation since it has the largest share in CPI basket. In fact, the rise in milk prices was driven in part by export demand for live animals and increased transportation and feed costs. Similarly the domestic cost of transportation, production and distribution of various goods and services like soft drinks, ready made food products was adversely

affected by the surge in international oil prices. Similarly, instead of increased area under chilies, unfavorable weather was a major factor behind decline in production of these crops in year 2004. Water shortage and termite attack also contributed to the fall in production of chilies.

The price of meat continued to rise during 2004 on the back of strong external demand for beef and mutton from Middle East and Afghanistan coupled with strong domestic demand. The increase in the prices of fruits and vegetables appear to be the result of decline in the production of these crops due to water shortage and termite attack. It is interesting to note that food inflation of 2003 was mainly due to the combined increase in the prices of onion and potatoes. The rise in the prices of these items appears to be the result of speculative hoarding. In the case of tomato, severe supply shock caused to raise its prices during 2003. The extent of this supply crunch was so acute that its average prices reached to Rs. 32.6/kg in November 2003 as compared with only Rs 11.5/kg in November 2002. The heavy and prolonged rains in most parts of the country during 2004 also damaged some of the minor crops (e.g., potato, onion, tomato, etc.) leading to a temporary rise in the prices of these items.

## Conclusion and Recommendations

The present study explores the welfare effects of food price changes. The study has attempted to shed light on the important linkages between higher food prices and household welfare for years 2001-02 and 2005-06 using the Household Integrated Survey Data and analyze the welfare effects for rural-urban segments of Pakistan. As there are considerable differences in the composition of the consumption basket between rich and poor so the survey data of both years is disaggregated into four sub-samples according to the expenditure levels of rural-urban segments based on head count index. Specifically, the study measures the welfare effects of food price increases, differentiating household by status (poor and non poor) and by region (urban and rural). The study focuses on thirteen food groups to accurately represent a complete food demand.

The food expenditures are mainly inelastic. Due to the large budget shares of food items in the consumer basket, an increase in prices led to decrease purchasing power as people cannot afford to buy goods in quantities they need which leads to a lower level of welfare in the society. In this regard, the welfare effects of food price changes has been explored by focusing on the magnitude of the cost

involved in increasing the welfare among various income groups due to price change, by using income variation and equivalent variation based on Linear Expenditure System (LES).

The marginal budget shares for poor households indicate that the largest portion of food budget goes to cereals, pulses, milk products and vegetables. On the other hand, fruit, meat ready-made are the most important commodity groups in the food budget of the rich households. The study find evidence of low-income elasticities of cereal, pulses and vegetables in absolute values this indicates that as the level of income increases the expenditures of these commodities decreases for both rural and urban households. The study confirms that cereal, pulses and vegetable as staple food for both urban and rural poor households. The elasticities of different commodities with respect to total expenditure shows similar pattern. For majority of the commodities the overall elasticities for the urban and the rural sectors are considerably same.

With regard to study objective i.e., to evaluate the welfare consequences of the relative food price changes, the result suggests that household consumption did respond to relative price changes. Food price changes have had differential effects on the population. The study finds the remarkable increases in the food prices resulted in severe erosion of real income and purchasing power for the poor. The results indicate the degree of vulnerability that the poorest households have regarding staple food price increases. In the case of meat the percentage change is low for poor. The burden of cereal price increases fell largely on the rural poor households while the urban households have also resulted in decreasing purchasing power in higher cereal prices. It is evident that cereals, pulses and dairy products are the major source of welfare in urban, rural and overall Pakistan. Thus, the study examine large food expenditure differences for poor and non poor households, providing evidence for policymakers of the need to design different policies depending on the segment of the population being targeted. In Pakistan more than half of the poor live in rural areas, and between two-thirds and three-fourths of them have access to a plot of land. However, even if they produce some of the food they consume, most of them are net buyers of food and are hurt by higher food prices. Giving this group access to more land or more productive methods would reduce their dependence on purchasing food in the market. To improve access to seeds, fertilizers, small animals, land, credit to purchase inputs, and technical assistance would also help rural poor consumers to cope with rising food

prices.

For urban sector, policymakers and multilateral institutions should give priority to implement safety net programs i.e. increased the amount of the transfer to compensate for the loss in the purchasing power, food ration, and school feeding programs and allocate the additional fiscal resources needed to fund safety net program. Higher income results in higher standard of living. Thus, the government should manage to increase wages, pensions and salaries so that the purchasing power of the people could be increased. The government should also successfully create new jobs in urban sector to solve the unemployment problem and dependency ratio.

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