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Food Consumption Patterns and Implications for Poverty Reduction in Pakistan

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INTRODUCTION

The global food crisis of mid-2000s resulted in a several-fold increase in the prices of essential food items. Resultantly, the incidence of food insecurity, hunger, and poverty has increased in many developing countries [Ivanic and Martin (2008); Harttgen and Klasen (2012); De Hoyos and Medvedev (2009); World Bank (2010); Regmi and Seale (2010); Andreyeva, *et al.* (2010). Pakistan is also hit hard by this crisis. Prices of several food items increased by more than a 100 percent since 2006-07. Consequently, nearly half of the population is currently unable to meet its minimum (subsistence) caloric requirements for healthy and productive living [Malik, *et al.* (2014)]. A large proportion of household expenditure is spent on food (on average about 48 percent in 2010) and thus very little is left for the other expenditures necessary for human welfare, such as, health and education. Moreover, dietary diversity is extremely limited. Nearly 70 percent of food expenditure is on cereals, dairy, sweeteners, and fats. Wheat is the major source of calories, providing about half of the total daily calories [Malik, *et al.* (2014)]. However, the price of wheat increased by 125 percent between 2005-6 and 2010-11. Existing analyses indicate that these price shocks entail significant additional expenditures to maintain their pre-crisis consumption levels [Haq, *et al*. (2008); Friedman, Hong, and Xiaohui (2011)]. There is thus overwhelming evidence that rising food prices and the decline in real wages have serious implications for poverty, food security, and nutrition through food consumption patterns in the country.

In Pakistan, several studies have examined the effect of price change on consumption patterns during the last four decades [Siddiqui (1982); Burney and Khan (1991); Malik and Sarwar (1993); Burki (1997); Farooq, *et al*. (1999); Shamim and Ahmad (2007); Haq, *et al*. (2008, 2011)]. However, the analysis in these studies is based mostly on the data collected before the food price hike (i.e., before 2008). Some post-

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price-crisis studies, for example, Haq (2008, 2011) and Friedman, Hong and Xiaohui (2011), provide useful information on the impact of food price crisis on the welfare of Pakistan's population. However, these studies are limited in several ways by the assumptions underlying their analysis. For example, they assume similar consumption patterns across different household expenditure groups and across different regions of the country; and, thus fail to highlight the differential impact if any of the food price hike on the consumption patterns of poor and non-poor households located in different regions of the country. A fuller understanding of the consumer response to rising prices based on disaggregated analysis is essential for the policymakers to design effective and pro-poor food policy in the current scenario.

The main objective of this paper is to examine the extent of the impact of more recent price changes on consumer behaviour at a disaggregated level and highlight the policy implications for poverty, food security, and nutrition in Pakistan. For this purpose, using the data of the most recent publicly available and nationally representative Household Integrated Economic Survey (HIES) 2010-11, we estimate the Linear Approximate Almost Ideal Demand System (LA-AIDS) for ten food groups: wheat and wheat flour; rice including all kinds of rice consumed; other cereals; pulses; fruits and vegetables; milk and milk products including desi ghee and butter; meat (beef, mutton, fish and poultry); edible oil; sugar and other sweetener; and other food items (tea, condiments and spices, etc.). We divide households into two groups: poor and non-poor, and differentiate for rural and urban areas.

This paper is divided into five sections. Methodology and data are described in Section 2. A descriptive analysis of food consumption patterns is presented in Section 3. Section 4 presents a discussion of the results of LA-AIDS model and estimated elasticties. Implications of food consumption patterns for poverty reduction are presented in Section 5. Conclusions and policy recommendations are given in the final section.

2. METHODOLOGY AND DATA

2.1. Methodology

To estimate the income and price elasticities of ten food items, we use the Linear Approximate Almost Ideal Demand System (LA-AIDS) proposed by Deaton and Muellbauer (1980a, 1980b). This demand system derives budget share equation from the specification of Price Independent Generalised Logarithmic (PIGLOG) cost function introduced by Muellbauer (1976). The model has budget shares as dependent variables and logarithm of prices and real expenditure/income as regressors. The LA-AIDS model satisfies the desirable properties of a demand theory. The LA-AIDS demand equation in budget share form is:

$$w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} + \ln(p_j) + \beta_i \ln\left(\frac{x}{P}\right) + e_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

In Equation (1), n is the number of goods, w_i is the budget share of good i, p_j is the price of good j, x is expenditure, P is a price index approximated by the Stone price index ($\ln(P) = \sum_j w_j ln(p_j)$) and α_i, γ_{ij}, and β_i are parameters. Separability is imposed at the food level, implying that consumers modify their optimal food consumption bundle when relative prices of individual food items change, given an

optimal allocation of expenditure on food. Due to separability, the marginal rate of substitution between any food items is independent of the changes in the non-food items. To account for the household characteristics, Equation (1) is augmented with household specific socio-economic, demographic, provincial, and regional (briefly socio-economic) characteristics using the following relationship proposed by Pollak and Wales (1981).

$$\alpha_i = \alpha_i^* + \sum_j \delta_{ij} z_j \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where $z_j$is a matrix of socio-economic variables and δ_{ij} is the vector of parameters. Substituting Equation (2) in the Equation (1) yields:

$$w_i = \alpha_i^* + \sum_{j=1}^{n} \gamma_{ij} + \ln(p_j) + \beta_i \ln\left(\frac{x}{P}\right) + \sum_{j=1}^{n} \delta_{ij} z_j + e_i \quad \ldots \quad \ldots \quad (3)$$

Equation (3) is estimated for ten food items mentioned above for whole Pakistan. The theoretical restrictions on the demand function are imposed during estimation. These restriction include the following:

Adding-up:

$$\sum_i^n \alpha_i^* = 1, \quad \sum_i^n \gamma_{ij} = 0, \quad \sum_i^n \beta_i = 0 \qquad \forall \text{ all } i \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Homogeneity:

$$\sum_i^n \gamma_{ij} = 0, \quad \forall j \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Symmetry:

$$\gamma_{ij} = \gamma_{ji} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Using Equation (3), uncompensated and compensated, expenditure elasticities can be derived. The uncompensated price elasticity for good *i* with respect to good *j* is $e_{ij} = \frac{\gamma_{ij} - \beta_i}{w_i} - \delta_{ij}$. Compensated price elasticity for good *i* with respect to good *j* is $e_{ij} = \frac{\gamma_{ij}}{w_i} + w_j - \delta_{ij}$, Where δ_{ij} is the Kronecker delta and it equals one for own price and zero for cross-price elasticities. The expenditure elasticity (E_i) is $E_i = 1 + \frac{\beta_i}{w_i}$.

The seemingly unrelated regression estimation method of Zellner (1963) is employed to estimate the system of equations. The statistical significance of the estimated elasticities is derived using the delta method. Imposing the property of additivity of the expenditure function makes the variance and covariance matrix singular and one of the equations needs to be omitted to estimate the LA-AIDS. The expenditure equation for "other food" is omitted and the coefficients for the omitted equation are derived using the theoretical conditions imposed on the estimation process. However, the coefficients estimated using LA-AIDS are invariant to the omitted equation.

2.2. Data

The data used in this study is derived from the nationally representative Household Integrated Economic Survey (HIES) 2010-11 (the most recent data

available). HIES 2010-11 covers 16,341 households selected from the urban and rural areas of all four provinces of Pakistan. A two-stage stratified random sample design was adopted to select the households. In the first stage, 1,180 primary sampling units (enumeration blocks) were selected in the urban and rural areas of all four Pakistan provinces. In the second stage, the sample of 16,341 households was randomly selected from these primary sampling units. Using a random systematic sampling scheme with a random start, either 16 or 12 households were selected from each primary sampling unit [Pakistan (2011)]. The HIES collects detailed information on the quantity and value of consumption of various food items. This information enables us to examine the budget share of different food items to estimate the LA-AIDS system. In addition, HIES collects data on various household and individual characteristics that allows the estimation of LA-AIDS demand system by controlling for various factors other than prices and income.

3. CONSUMPTION PATTERNS OF FOOD

In this section we examine the underlying food budget shares, calories consumption and the cost of calories across poor and non-poor households by urban or rural households. We classify households who fall in the lowest two per capita expenditure quintiles.[1]

3.1. Food Budget Shares

Food accounts for 54 percent of total expenditure; 46 percent in urban areas and 58 percent in rural areas. Of total expenditure, non-poor spend about 51 percent and poor 57 percent on food. On average Rs 1695 per adult equivalent per month are spent on food; Rs 1137 by the poor and Rs 2070 by the non-poor. Cereals and dairy products are important food items in the diet of Pakistani households; constitute nearly 46 percent of total food expenditure. Wheat is the most important cereal, accounts for 22 percent of the food expenditures for the poor; 20 percent in urban areas and 22.9 percent in rural areas. Whereas, non-poor households spend 14.5 percent of food expenditure on wheat; 11.9 percent in urban areas and 15.9 percent in rural areas. Relative to wheat, rice accounts for only one fourth of wheat's expenditure share. Other cereals make up less than half a percentage of the food expenditures across the board (Table 1).

The share of expenditures on dairy products is higher than the share for cereals. Similar trends are observed for urban and rural areas. Poor spend more on wheat and non-poor on dairy products. Most of the dairy products are consumed in the form of milk and ghee. The other important categories but with much lower shares are fruits and vegetables, oils, and sugar. These food groups account for 13 percent, 10.8 percent, and 10.5 percent, respectively of food expenditures. Pulses make up about 3 percent of the total food expenditures.

[1]The average calories consumption for households, which fall in these two lowest quintiles is 2260 per capita, which is lower than the nationally accepted poverty line consumption of 2350 per ae per day.

Table 1

Budget Shares by Food Groups; by Urban and Rural and Poverty Status

	Urban			Rural			Pakistan		
Food Group	Overall	Non-Poor	Poor	Overall	Non-Poor	Poor	Overall	Non-Poor	Poor
Share of Food Expenditure in Total Expenditure (%)	46.5	42.5	52.4	57.6	56.1	60	53.8	51.4	57.4
Share in Food Expenditure (%)									
Wheat	15.2	11.9	20.1	18.7	15.9	22.9	17.5	14.5	22.0
Rice	3.8	3.6	4.0	3.8	3.8	3.7	3.8	3.7	3.8
Other Cereals	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4
Pulses	2.9	2.8	3.2	2.9	2.9	3.0	2.9	2.8	3.0
Fruits/Vegetables	13.3	13.5	13.0	12.9	13.1	12.7	13.0	13.2	12.8
Dairy	24.3	26.3	21.3	24.3	26.9	20.4	24.3	26.7	20.7
Meats	12.1	14.6	8.5	8.4	9.8	6.4	9.7	11.4	7.1
Oils	10.5	9.5	11.9	11.0	10.2	12.1	10.8	10.0	12.1
Sugars	9.7	9.4	10.1	11.0	10.6	11.6	10.5	10.2	11.1
Other	7.8	7.9	7.7	6.6	6.5	6.8	7.0	7.0	7.1

Source: HIES 2010-11.

3.2. Calorie Consumption

The HIES provides information on the consumed quantities of various food items. The consumption aggregate includes not only actual purchases but also self-produced and consumed items, consumption of items that were received as gifts, plus items provided in place of monetary compensation. Using the Food Composition Tables for Pakistan (2001), we converted these quantities into calories. The average calorie consumption is reported in Table 2. This table shows that wheat provides bulk of calories. Nearly 52 percent of the calories come from wheat for poor households. This proportion is higher in rural areas than that in urban areas. The second largest source of calories for the poor is cooking oil/fats followed by dairy products and sugars. The expenditure and calorie intake patterns signify an unhealthy diet patterns of the people of Pakistan.

Table 2

Calorie Shares of Food Items (%) by Urban, Rural and Poverty Status (2010-11)

	Urban			Rural			Pakistan		
Food Groups	Overall	Non-Poor	Poor	Overall	Non-Poor	Poor	Overall	Non-Poor	Poor
Total Calories Per Adult Equivalent Per Day	2,086	2,289	1,782	2,351	2,664	1,882	2,260	2,535	1,848
% Share in Total Calories									
Wheat	42.6	38.2	49.2	48.6	45.4	53.3	46.5	43.0	51.9
Rice	6.0	6.0	6.1	5.3	5.4	5.2	5.6	5.6	5.5
Other Cereals	0.5	0.5	0.3	0.7	0.8	0.6	0.6	0.7	0.5
Pulses	2.6	2.7	2.5	2.2	2.3	2.0	2.3	2.4	2.2
Fruits/Vegetables	5.0	5.3	4.5	4.2	4.4	4.0	4.5	4.7	4.2
Dairy	13.4	15.7	10.0	13.0	15.1	10.0	13.2	15.3	10.0
Meats	3.5	4.4	2.1	2.0	2.5	1.4	2.5	3.1	1.6
Oils	15.3	15.7	14.7	13.1	13.2	13.0	13.9	14.1	13.6
Sugars	9.7	9.8	9.6	10.1	10.2	10.0	10.0	10.1	9.8
Other	1.4	1.6	0.9	0.6	0.7	0.5	0.9	1.0	0.7

Source: Computed from HIES (2010-11).

Despite calorie-dense diet, the overall per adult equivalent per day calorie intake (2260) is less than the officially recommended minimum per day intake of 2350 calories. The average calorie intake for the poor (1848) is significantly lower than the recommended intake of calories. The calorie intake of urban poor is lower than the rural poor. The data reported in Table 2 shows that the poor households, irrespective of the place of residence, are not able to obtain 2150 calories per day.

3.3. Cost of Calories

The evidence indicates that the Pakistani diet is not calorie efficient in terms of expenditures. The cost per calorie varies significantly across rural urban areas and poverty status. Using the average food expenditure per adult equivalent per day and calories per adult equivalent per day, we computed the average cost of 100 calorie. In view of the importance of wheat, we also computed the cost of 100 calories derived from wheat. Results are presented in Table 3. This table shows that non-poor spend more to obtain 100 calories both in urban as well as rural areas. Overall a household spends Rs 2.52 to obtain 100 calories. However, looking at the cost of calories from wheat (last column), one can note that poor are paying a higher amount to get 100 calories from wheat than the non-poor. Calories, especially from wheat that is the major source of calories, can become more expensive if prices of wheat continue to rise.

Table 3

Calories Consumed and the Cost of Calories (kcals/rupee)

Region or Population Group	Population % of Total	Total Calories (Daily per A.E)	Food Expenditure (Daily per A.E.) (Rs)	100 Calories Cost Overall Food (Rs)	Expenditure on Wheat (per Adult Equivalent) (Rs)	Calories from Wheat (Daily per A.E.)	100 Calories Cost Wheat (Rs)
Rural Poor	31.2	1,882	36.77	1.95	8.15	1,006.9	0.81
Rural Non-Poor	35.6	2,664	67.00	2.52	7.73	1,207.6	0.64
Urban Poor	15.8	1,782	40.06	2.25	9.20	881.3	1.04
Urban Non-Poor	17.5	2,289	74.82	3.27	7.25	871.7	0.83
National	100.00 (130.12)	2,260	56.96	2.52	7.28	1,041.1	0.70

Source: Authors calculations based on HIES 2010-11.
Note: Figure in parenthesis is total estimated population in millions from HIES (2010-11) data.

4. ESTIMATED DEMAND ELASTCITIES

In this section we present estimates from the Linear Approximate Almost Ideal Demand System LA-AIDS model for the 2010-11 data discussed above. Per capita demand elasticities are estimated by controlling for various socioeconomic variables including poverty status of a household, regional and provincial differences, and seasonality effects. Food items are categorised into ten groups: wheat and wheat flour; rice including all kinds of rice consumed; other cereals; pulses; fruits and vegetables; milk and milk products including desi ghee and butter; meat (beef, mutton, fish and poultry); edible oil; sugar and other sweetener; and other food items (tea, condiments and spices, etc.).

The HIES does not collect information on prices of food items for each household. However, it collects data on the quantity consumed and total expenditure on food items in detail. This enables us to calculate the unit value of consumed food items for each household. These unit values are used as proxy of prices[2] in our estimation. In addition to prices and household per capita food expenditure, several socioeconomic variables are included in the model: three binary variables indicating three levels of education (primary, middle, and high) of the household head; binary variables representing employment of the household head (self-employed, farmer, employee); three dummies representing the quarter when data were collected; dummies representing the provinces of Punjab, Sind and Khyber Pakhtunkhwa (KPK), urban/rural areas and poverty status. The HIES survey is conducted over four quarters of the year. This enables us to test explicitly for differences in consumption across seasons.

4.1. Estimated LA-AIDS Model

The descriptive statistics show this variation in the prices of food items across region (rural/urban) and poverty status. These are presented in Annexure Table 1. Prices are higher in urban areas than that in rural areas and non-poor households pay more as compared to poor households. The socio-economic variables indicate that household residing in urban areas are better than the rural households and non-poor households are better than the poor households in terms of education. A majority of households is engaged in wage employment and this proportion is not very different across rural/urban area or poverty status. A higher percentage of the rural population is poor (48 percent) as compared to urban areas (25 percent).

Most of the estimated coefficients from the model are significant at least at the 95 percent level of significance. The estimated equations for the ten food items are presented in Annexure Table 2. Significant differences in consumption patterns are observed between urban and rural areas, among provinces, and across poverty status. For example, urban households spend less on wheat, rice, other cereals, pulses, edible oil, and sugar and more on fruits and vegetables, dairy and meat than the rural households. The expenditure share of wheat is lower and rice is higher in all provinces as compared to Baluchistan (the reference province). The expenditure on pulses, fruits and vegetables, meat and sugar is significantly higher and the consumption of dairy is significantly lower in Baluchistan as compared to other provinces. The results indicate that household where head is educated up to the primary level consume more rice, other cereals and edible oils. The consumption of dairy products and meat significantly increases and that of edible oil and sugar decreases as education improves. Results show a significant decline in wheat consumption as education improves. Farm households spend significantly more on rice and other cereals and dairy as compared to non-farm households. However, no significant difference in the consumption of wheat between farm and non-farm households is observed. This table shows significant differences for poor and non-poor households. For example, comparing with non-poor households, poor households spend more on cereals, dairy, and sugar and less on meat, fruits and vegetables.

[2]Since all items are not consumed by all households the problem of missing prices arises. In order to keep these missing observations in the analysis, we followed Cox and Wohlgenant (1986) and replaced the missing prices with the average price of an item prevailing in the primary sampling unit (PSU).

These results confirm a priori expectations. There are significant seasonality effects. For example, wheat consumption is higher in quarter 4 (April-June), the period after wheat harvest. However, the seasonality effect in wheat consumption appears insignificant. Rice consumption is higher in quarter 3 (January-March), the period after rice harvest. Meat consumption is found to be statistically significantly higher in quarter 2 (October-December). Eid-ul-Adha, was celebrated in the second quarter in November in 2011. The consumption of fruits and vegetables is higher in the first quarter (July-September). These are the months when a variety of fruits and vegetables become available in the market.

4.2. Expenditure Elasticities

Based on these estimates from the LA-AIDS model, we computed expenditure elasticities by rural and urban areas, and poverty status (see Table 4). Overall the expenditure elasticities are positive and significant suggesting that all goods are normal. The elasticities are greater than one for dairy and close to unity for rice, and sugar suggesting that these food items are most responsive to expenditure changes or luxuries. Similar patterns are observed for rural and urban areas. The elasticities of wheat and pulses appear slightly more elastic for rural areas as compared with urban areas. This indicates that a small change in expenditure affects the demand of these two items more in the rural areas.

Table 4

Expenditure Elasticities of Demand (2010-11)

	Rural Areas			Urban Areas			Pakistan		
Food Groups	Poor	Non-poor	Overall	Poor	Non-poor	Overall	Poor	Non-poor	Overall
Wheat	0.835	0.754	0.792	0.915	0.668	0.736	0.849	0.715	0.770
Rice	0.882	0.758	0.832	1.237	0.938	1.026	0.945	0.829	0.913
Other Cereals	0.129	1.227	0.791	0.252	1.134	1.024	0.072	1.259	0.890
Pulses	0.829	0.719	0.755	0.740	0.650	0.651	0.814	0.677	0.713
Fruits/Vegetables	0.879	0.882	0.877	1.019	0.947	0.959	0.907	0.909	0.910
Dairy	1.919	1.696	1.798	1.638	1.449	1.494	1.871	1.607	1.696
Meat	0.665	0.791	0.732	0.738	1.015	0.985	0.677	0.892	0.823
Cooking Oil	0.616	0.563	0.588	0.582	0.672	0.648	0.612	0.604	0.606
Sugars	0.840	0.863	0.863	0.967	1.072	1.063	0.865	0.956	0.939
Other	0.717	0.696	0.704	0.678	0.789	0.759	0.713	0.730	0.718

Source: HIES 2010-11.

Note: All results significant at 99 percent confidence level.

* calculated using weighted Expenditure shares.

Comparing poor and non-poor households, Table 4 shows that poor households are more responsive to any changes in expenditures in both urban as well as rural areas. However, comparing the poor households across urban and rural areas, the results in Table 5 show that the urban poor are more responsive to expenditure changes than the rural poor for all food items except for pulses and meats. Any change in the expenditure of these two food items changes their demand more for urban poor. For non-poor households of urban areas, the expenditure elasticity of rice, meat, dairy products, fruits and vegetables, and sugar falls in the range of 0.938 to 1.449. This indicates that the

demand of these items changes more with a change in expenditure. Similar pattern, with a slightly lower value of the elasticities, is observed for rural non-poor. These results clearly show that a rise in income results in increasing the demand for expensive food items for poor as well as non-poor households both in urban and rural areas.

4.3. Own and Cross Price Elasticities

Own and cross price elasticities represent consumers' response to price change. To examine the welfare effect of price change, we computed uncompensated as well as compensated price elasticities. The uncompensated elasticity of demand represents changes in the quantity demanded as a result of changes in prices, capturing both substitution and income effect, whereas, compensated elasticity of demand describes only the substitution effect as a result of price change, keeping the level of utility constant. The demand for most of the commodities (except 'other cereals' in rural areas) is price inelastic (Table 5). These elasticities are statistically significant and have the expected signs. Compensated price elasticities are less than the uncompensated elasticities, which indicates that all the goods are normal. These elasticities show the responsiveness to prices and determine the consumption patterns of poor and non-poor households in the rural and urban areas of Pakistan.

Table 5

Own Uncompensated and Compensated Price Elasticities of Demand (2010-11)

	Rural areas			Urban areas			Pakistan		
Food Group	Poor	Non-poor	Overall	Poor	Non-poor	Overall	Poor	Non-poor	Overall
Uncompensated Elasticities									
Wheat	–0.350	–0.348	–0.360	–0.357	–0.200	–0.242	–0.352	–0.281	–0.317
Rice	–0.478	–0.383	–0.433	–0.902	–0.568	–0.684	–0.551	–0.450	–0.510
Other Cereals	–1.523	–1.817	–1.679	–0.530	–0.303	–0.333	–1.529	–1.336	–1.408
Pulses	–0.271	–0.332	–0.301	–0.465	–0.280	–0.327	–0.307	–0.291	–0.291
Fruits/ Vegetables	–0.595	–0.437	–0.506	–0.580	–0.421	–0.451	–0.591	–0.438	–0.495
Dairy	–0.947	–0.665	–0.761	–0.848	–0.840	–0.834	–0.920	–0.713	–0.769
Meats	–0.366	–0.148	–0.233	–0.553	–0.194	–0.239	–0.408	–0.190	–0.257
Cooking oil	–0.173	–0.271	–0.226	–0.096	–0.257	–0.209	–0.162	–0.244	–0.210
Sugars	–0.875	–0.451	–0.721	–0.881	–0.452	–0.604	–0.874	–0.441	–0.674
Other	–0.410	–0.396	–0.403	–0.605	–0.304	–0.390	–0.452	–0.365	–0.405
Compensated Elasticities									
Wheat	–0.165	–0.227	–0.209	–0.155	–0.107	–0.123	–0.163	–0.173	–0.179
Rice	–0.440	–0.353	–0.399	–0.851	–0.533	–0.645	–0.511	–0.419	–0.473
Other Cereals	–1.522	–1.811	–1.676	–0.529	–0.299	–0.330	–1.528	–1.331	–1.404
Pulses	–0.246	–0.311	–0.279	–0.441	–0.262	–0.308	–0.282	–0.272	–0.270
Fruits/ Vegetables	–0.484	–0.321	–0.393	–0.448	–0.291	–0.321	–0.476	–0.315	–0.376
Dairy	–0.581	–0.242	–0.364	–0.550	–0.500	–0.506	–0.567	–0.324	–0.396
Meats	–0.316	–0.062	–0.165	–0.495	–0.056	–0.121	–0.356	–0.081	–0.172
Cooking oil	–0.101	–0.213	–0.162	–0.025	–0.189	–0.140	–0.090	–0.183	–0.145
Sugars	–0.773	–0.356	–0.621	–0.769	–0.340	–0.490	–0.770	–0.339	–0.568
Other	–0.361	–0.350	–0.355	–0.555	–0.242	–0.331	–0.402	–0.313	–0.354

Source: Authors estimates using HIES 2010-11.

Note: All results significant at 99 percent confidence level.

A perusal of Table 5 shows some interesting findings. For example, the demand for most of the commodities (except 'other cereals') is price inelastic, ranging from –0.21 (cooking oil) to –0.77 (dairy). Cooking oil appeared least responsive to price change, both in rural as well urban areas irrespective of the poverty status. However, the absolute value of elasticity is the lowest for the urban poor. Poor and non-poor households respond in similar manner to the price change of dairy products in urban areas. The own price elasticity of 'other cereals' is greater than one indicates high responsiveness to price changes. However, rural-urban disaggregation shows 'other cereals' are inelastic for urban households and highly elastic for rural households. The price elasticity of rice in urban areas, especially for poor appeared relatively high. Wheat and other cereals are less price responsive for urban non-poor households. Although poor and non-poor households respond differently for the change in prices of fruits and vegetables, and sugar within rural or urban areas, the response behaviour of rural poor and urban poor, and rural non-poor and urban non-poor is similar. A considerable difference between uncompensated and compensated elasticities of wheat (–0.317 and –0.178) and dairy (–0.769 and –0.396) for all households irrespective of the place of residence and poverty status is observed. This indicates that maintaining the same utility level after a price change reduces the price responsiveness of these two food items.

Cross price elasticities indicate the effect of a price change in one commodity on the demand for another commodity. The estimated uncompensated and compensated cross price elasticities for rural areas, urban areas and overall Pakistan are reported in Tables 6, 7, and 8, respectively. Uncompensated elasticities indicate that most of the food items are complements of each other (negative cross price elasticities). However, if household expenditures are adjusted (compensated) to keep them at the old utility level, most of the food items become substitutes. This means that when price increases are offset by equivalent income increases to maintain the original utility level, households make substitution. The number of substitutes is higher in rural areas as compared to urban areas.

The low and insignificant value of the cross price elasticity of wheat and rice suggests that the consumption of wheat and rice are largely independent of price changes of either commodity which may illustrate the strong individual household preference for wheat and rice in Pakistan. A positive and significant cross price elasticity of wheat with other cereals indicates that households substitute other cereals in case of an increase in wheat price, or vice-versa. This result is consistent with the findings of Farooq, *et al.* (1999), Haq, *et al.* (2011). The importance of dairy and its products can be observed through the complementarity between dairy products and all other food items. An increase in the price of other food items reduces the demand for dairy and its products. However, an adjustment in expenditure to offset the price increase of other food items allows substation for dairy products. This situation holds in both urban and rural areas. Our results confirm the importance of wheat and dairy products for the households in Pakistan irrespective of the place of residence. Other cereals including rice appear to be the weak substitutes of wheat.

Table 6

Cross Uncompensated and Compensated Price Elasticities for Rural Pakistan (N=9,496)

Food Groups	Wheat	Rice	Other Cereals	Pulses	Fruits and Vegetables	Dairy	Meat	Oils	Sugars	Others
Uncompensated Elasticities										
Wheat	–0.360	–0.138	0.571	–0.047	–0.240	–0.325	–0.207	0.006	–0.071	–0.092
Rice	0.008	–0.433	–0.596	–0.074	–0.010	–0.160	–0.008	–0.034	0.027	–0.007
Other Cereals	0.053	–0.060	–1.679	0.042	0.034	–0.176	–0.001	0.054	0.024	0.025
Pulses	0.031	–0.051	0.223	–0.301	0.005	–0.177	–0.021	–0.016	–0.011	–0.006
Fruits & Vegetables	–0.133	–0.074	0.525	–0.041	–0.506	–0.205	–0.004	–0.093	0.046	–0.061
Dairy	–0.132	0.096	–0.010	0.000	–0.033	–0.761	–0.116	–0.152	–0.103	–0.093
Meat	–0.073	–0.067	–0.518	–0.137	–0.005	–0.235	–0.233	–0.073	0.002	–0.091
Cooking Oil	0.018	–0.201	0.213	–0.219	–0.101	–0.273	–0.114	–0.226	–0.036	–0.068
Sugar	–0.013	0.038	0.206	–0.099	0.043	–0.239	0.007	–0.010	–0.721	–0.004
Others	–0.002	–0.040	0.076	–0.052	–0.029	–0.210	–0.054	–0.007	0.003	–0.403
Compensated Elasticities										
Wheat	–0.209	0.046	0.761	0.136	–0.065	0.042	–0.041	0.152	0.104	0.079
Rice	0.010	–0.399	–0.556	–0.040	0.015	0.058	0.008	–0.038	0.052	0.014
Other Cereals	0.018	–0.062	–1.676	0.039	0.023	0.004	–0.021	0.013	0.013	0.009
Pulses	0.021	–0.029	0.251	–0.279	0.018	0.028	–0.016	–0.031	0.003	0.004
Fruits & Vegetables	–0.044	0.048	0.653	0.081	–0.393	0.100	0.100	–0.009	0.159	0.048
Dairy	0.048	0.309	0.209	0.213	0.172	–0.364	0.079	0.023	0.101	0.107
Meat	–0.020	0.019	–0.426	–0.052	0.071	0.033	–0.165	–0.026	0.078	–0.018
Cooking Oil	0.087	–0.100	0.320	–0.117	–0.008	0.012	–0.030	–0.162	0.057	0.021
Sugar	0.063	0.147	0.322	0.010	0.143	0.054	0.098	0.061	–0.621	0.092
Others	0.026	0.020	0.143	0.008	0.023	0.033	–0.011	0.015	0.054	–0.355

Source: Authors estimates using HIES 2010-11.

Table 7

Cross Uncompensated and Compensated Price Elasticities for Urban Pakistan (N = 6,209)

	Wheat	Rice	Other Cereals	Pulses	Fruits and Vegetables	Dairy	Meat	Oils	Sugars	Others
Uncompensated Elasticities										
Wheat	–0.242	–0.175	–0.884	–0.048	–0.189	–0.229	–0.239	0.015	–0.080	–0.137
Rice	0.002	–0.684	0.409	–0.045	–0.053	–0.131	0.002	0.051	0.068	0.000
Other Cereals	0.025	0.035	–0.333	–0.007	0.017	–0.107	–0.006	0.008	0.001	0.035
Pulses	0.032	–0.044	–0.149	–0.327	–0.019	–0.101	–0.050	0.014	–0.052	0.014
Fruits & Vegetables	–0.120	–0.210	0.480	–0.101	–0.451	–0.126	–0.047	–0.133	–0.011	–0.098
Dairy	–0.120	–0.130	0.110	0.063	–0.023	–0.834	–0.016	–0.108	–0.121	0.047
Meat	–0.136	–0.001	–0.296	–0.201	–0.038	–0.118	–0.239	–0.173	–0.106	–0.165
Cooking oil	0.028	0.036	–0.923	–0.076	–0.128	–0.179	–0.185	–0.209	–0.108	–0.069
Sugar	–0.006	0.209	0.238	–0.153	0.002	–0.165	–0.087	–0.065	–0.604	–0.050
Others	–0.035	–0.046	0.346	–0.003	–0.064	–0.096	–0.114	–0.025	–0.053	–0.390
Compensated Elasticities										
Wheat	–0.123	–0.012	–0.722	0.104	–0.032	0.042	–0.079	0.140	0.089	0.007
Rice	–0.003	–0.645	0.447	–0.017	–0.020	0.016	0.038	0.051	0.112	0.020
Other Cereals	–0.015	0.039	–0.330	–0.014	0.015	0.005	–0.005	–0.026	0.011	0.020
Pulses	0.019	–0.013	–0.119	–0.308	0.005	0.037	–0.022	0.006	–0.015	0.024
Fruits & Vegetables	–0.027	–0.073	0.616	0.025	–0.321	0.118	0.087	–0.035	0.131	0.019
Dairy	0.057	0.091	0.330	0.273	0.192	–0.506	0.202	0.075	0.105	0.248
Meat	–0.058	0.120	–0.176	–0.091	0.077	0.110	–0.121	–0.091	0.020	–0.064
Cooking oil	0.092	0.144	–0.816	0.020	–0.027	0.036	–0.081	–0.140	0.005	0.019
Sugar	0.059	0.317	0.346	–0.056	0.104	0.051	0.018	0.005	–0.490	0.039
Others	–0.001	0.033	0.424	0.064	0.008	0.090	–0.038	0.015	0.031	–0.331

Source: Authors estimates using HIES 2010-11.

Table 8

Cross Uncompensated and Compensated Price Elasticities for Overall Pakistan (N = 15,705)

Food Groups	Wheat	Rice	Other Cereals	Pulses	Fruits and Vegetables	Dairy	Meat	Oils	Sugars	Others
Uncompensated Elasticities										
Wheat	–0.317	–0.137	0.085	–0.051	–0.222	–0.293	–0.215	0.008	–0.074	–0.105
Rice	0.010	–0.510	–0.460	–0.076	–0.020	–0.154	0.002	–0.009	0.043	–0.006
Other Cereals	0.043	–0.044	–1.408	0.032	0.030	–0.151	–0.001	0.038	0.017	0.036
Pulses	0.032	–0.058	0.169	–0.291	–0.008	–0.150	–0.029	–0.006	–0.028	0.005
Fruits & Vegetables	–0.131	–0.101	0.578	–0.081	–0.495	–0.180	–0.015	–0.108	0.034	–0.075
Dairy	–0.131	–0.001	0.126	0.031	–0.034	–0.769	–0.069	–0.143	–0.128	–0.047
Meat	–0.093	–0.038	–0.501	–0.158	–0.014	–0.195	–0.257	–0.107	–0.034	–0.111
Cooking Oil	0.021	–0.137	–0.117	–0.168	–0.111	–0.244	–0.137	–0.210	–0.064	–0.060
Sugar	–0.010	0.107	0.269	–0.125	0.035	–0.222	–0.026	–0.031	–0.674	–0.030
Others	–0.011	–0.047	0.263	–0.028	–0.042	–0.174	–0.070	–0.009	–0.024	–0.405
Compensated Elasticities										
Wheat	–0.179	0.039	0.264	0.120	–0.055	0.039	–0.054	0.145	0.098	0.054
Rice	0.009	–0.473	–0.421	–0.044	0.008	0.039	0.024	–0.012	0.076	0.014
Other Cereals	0.006	–0.043	–1.404	0.028	0.022	0.006	–0.016	0.000	0.014	0.020
Pulses	0.020	–0.032	0.198	–0.270	0.009	0.032	–0.018	–0.019	–0.005	0.014
Fruits & Vegetables	–0.040	0.027	0.709	0.042	–0.376	0.104	0.099	–0.018	0.159	0.036
Dairy	0.048	0.216	0.346	0.243	0.175	–0.396	0.133	0.035	0.086	0.153
Meat	–0.031	0.062	–0.398	–0.063	0.078	0.062	–0.172	–0.045	0.063	–0.028
Cooking Oil	0.087	–0.032	–0.010	–0.069	–0.015	0.017	–0.047	–0.145	0.037	0.028
Sugar	0.062	0.216	0.381	–0.021	0.136	0.044	0.068	0.039	–0.568	0.062
Others	0.019	0.021	0.334	0.035	0.017	0.051	–0.016	0.020	0.041	–0.354

Source: Authors estimates using HIES 2010-11.

5. FOOD CONSUMPTION PATTERNS AND IMPLICATIONS FOR POVERTY REDUCTION

Results presented in Tables 4–8 reinforce the importance of wheat for all households irrespective of their place of residence and poverty status. The average availability of wheat has fluctuated around 10 kg per capita per month since 2001-02 while the per capita consumption has remained lower not only than the per capita availability but also than the recommended quantity of 10 kg per capita per month [Pakistan (2011b)]. The overall gap between total availability and consumption has been increasing over time[3] (see Table 9). The price of wheat has an important impact on the welfare of the people. Available data show that an increase in the price of wheat resulted in significantly reducing the purchasing power of skilled and unskilled labour. Despite an increase in the nominal daily wages, the purchasing power of skilled and unskilled labour has declined by 34 and 32 percent respectively. An increasing trend in wheat prices and resultant decline in the purchasing power and reduction in wheat consumption has serious implications for food security, nutritional status, and poverty.

[3]A smaller value of gap in 2010-11 is driven by decline in the per capita availability of wheat.

Table 9

Per Capita Availability, Consumption, and Price of Wheat

	Wheat Availability and Consumption (kg/month)				Daily Wage in Lahore (Rs/day)		Wheat Flour Quantity can be Bought with Daily Wage in Lahore (kg)	
	Avail-ability	Consum-ption	Gap	Price (Rs/kg)	Skilled Labour	Unskilled Labour	Skilled Labour	Unskilled Labour
2001-02	9.6	8.9	0.7	10.1	298	182	30.8	18.8
2004-05	10.0	8.2	1.8	13.3	331	210	24.9	15.8
2005-06	10.6	8.1	2.5	13.1	369	230	28.3	17.6
2007-08	11.3	7.8	3.5	18.1	450	300	24.9	16.6
2010-11	10.0	7.9	2.1	30.3	600	375	20.4	12.8

Source: For wheat availability: Government of Pakistan (2011a), *Agriculture Statistics of Pakistan*.
For consumption: HIES (Various Issues).
For wheat prices and daily wages: Government of Pakistan (2014), *Economic Survey 2013-14*.

As discussed earlier that wheat is the most important food item in the diet of Pakistani households, provides bulk of calories (almost 48 percent). Its demand is very inelastic and preferences are very strong. An increase in the price of wheat may result in substitution with health and education that may worsen the already low human development indicators and may have adverse effect on already high levels of poverty in the country. This has serious implications not only for the money metric measures of poverty but also for other human development indicators, especially for the nutritional status.

As discussed in Section 3, Pakistani diet is dense in calories and macronutrients and deficient in micronutrient. Available national data show that the outcomes of micronutrient deficiency are noticeable amongst women and children. Nearly half of the women of child-bearing age are suffering from anemia, 43 percent in vitamin A deficiency, 48 percent in zinc deficiency, and 69 percent in vitamin D deficiency [Pakistan (2010-11)]. A malnourished woman is at higher risk of giving birth to an anemic or an underweight child (less than 2.5 kg). Such children have five times the risk of death in the first year and a high risk of growth failure during childhood and low birth weight may result in greater chronic diseases as an adult. As a result of high levels of malnutrition among women of child-bearing age, a large number of children under five years of age suffer from the vitamin A deficiency (54 percent), zinc deficiency (39 percent), and iron deficiency (62 percent). In addition, the prevalence of protein-energy malnutrition (PEM) is not only high but has also increased over time. In 2011 nearly 44 percent children were estimated to be stunted, 15 percent were wasted, and 32 percent were underweight. These proportions were 32.5 percent stunted, 11.2 percent wasted and 42.3 percent underweight in 2001. About 15 percent of Pakistan's population consists of children under five years of age. The human and economic potential in Pakistan is at risk due to high levels of malnutrition.

As discussed earlier, the high incidence of malnutrition amongst children has adverse effects on their intellectual development and consequently, their health and productivity in later life. A reduction in the purchasing power of the wage earners can further aggravate the situation. If the issues of limited dietary diversity, persistently rising prices of food, and increasing incidence of malnutrition are not addressed through

appropriate policy measures, the already alarming situation is likely to get worse. Addressing this alarming situation requires urgent development and implementation of appropriate policies and, more importantly, awareness building about the gravity of the situation.

6. CONCLUSIONS AND POLICY IMPLICATIONS

The analysis presented in this paper highlights several critical aspects of the situation. The diet of most of the Pakistani households comprises of energy-dense food, such as, cereals, dairy, fats, and sugars. A large proportion of households consume less than the recommended amount of calories: The calorie intake of urban poor is lower than the rural poor. Despite varying consumption patterns across rural and urban areas and for poor and non-poor households, demand for dairy, wheat, and cooking oil is similar for poor and non-poor across rural-urban areas.

A considerable difference between uncompensated and compensated elasticities of wheat (–0.317 and –0.178) and dairy (–0.769 and –0.396) for all households irrespective of the place of residence and poverty indicates that maintaining the same utility level after a price change reduces the price responsiveness of these two food items. Often this substitution means foregoing other critical consumption required to maintain a balanced diet.

Rising prices of wheat adversely affect calorie consumption and hence poverty status. An increase in the price of wheat may not reduce its consumption but may result in a decline in the expenditure on other non-food items, such as, education and health. An increase in wheat price may be helpful for the wheat growers who are net sellers. However, all net buyers of wheat suffer. It is therefore important to evaluate the effect of increasing wheat prices in a broader framework. A reduction in the purchasing power as a result of increase in the prices of essential food items has adverse effects on food security and prevalence of malnutrition in Pakistan. If the issues of limited dietary diversity, persistently rising prices of food, and issue of food security are not urgently addressed through appropriate policy measures, the situation will get worse. Addressing this alarming situation requires appropriate policies and, more importantly, awareness building about the gravity of the situation.

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Annexure Table 1

Descriptive Statistics of Dependent and Explanatory Variables

	Pakistan		Rural areas		Urban areas		Poor		Non-poor	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Prices (Rs/kg)										
Wheat	28.36	4.41	27.52	4.39	29.99	3.97	28.04	3.99	28.58	4.65
Rice	62.07	47.58	61.77	55.18	62.64	27.64	57.20	44.34	65.31	49.35
Other cereals	74.33	49.28	69.82	46.52	83.04	53.16	71.47	47.07	76.23	50.62
Pulses	105.11	28.16	103.92	31.18	107.39	21.01	101.92	27.25	107.23	28.56
Fruits and vegetables	38.09	13.50	36.99	13.15	40.21	13.91	34.27	11.14	40.64	14.30
Dairy products	51.25	37.46	49.00	37.27	55.58	37.44	47.26	32.97	53.91	39.95
Meats	185.23	78.29	182.62	78.38	190.23	77.88	177.12	60.72	190.63	87.67
Cooking oil	151.26	22.31	151.66	22.46	150.49	22.01	149.83	20.92	152.21	23.15
Sugar and sweeteners	103.57	956.75	108.73	1049.13	93.67	748.12	131.09	1439.39	85.22	378.70
Other food items	162.33	49.22	156.93	46.90	172.70	51.85	147.75	41.52	172.06	51.50
Socioeconomic variables										
Dummy (primary=1)	0.16	0.37	0.17	0.38	0.14	0.35	0.19	0.39	0.14	0.35
Dummy (secondary=1)	0.27	0.44	0.24	0.43	0.33	0.47	0.21	0.41	0.31	0.46
Dummy (high=1)	0.13	0.34	0.07	0.26	0.25	0.43	0.04	0.19	0.20	0.40
Dummy (farm =1)	0.17	0.38	0.25	0.44	0.02	0.13	0.17	0.38	0.17	0.38
Dummy (employee=1)	0.46	0.50	0.41	0.49	0.57	0.50	0.51	0.50	0.43	0.50
Dummy (self-employed=1)	0.15	0.35	0.12	0.32	0.21	0.40	0.13	0.34	0.16	0.36
Dummy (poor=1)	0.40	0.49	0.48	0.50	0.25	0.43				
Dummy (urban=1)	0.34	0.47					0.21	0.41	0.43	0.50
Dummy (Punjab=1)	0.59	0.49	0.62	0.49	0.55	0.50	0.59	0.49	0.60	0.49
Dummy (Sindh=1)	0.24	0.42	0.17	0.38	0.36	0.48	0.22	0.42	0.24	0.43
Dummy (KPK=1)	0.12	0.33	0.16	0.36	0.06	0.24	0.13	0.34	0.12	0.32
Dummy (Balochistan=1)	0.05	0.21	0.06	0.23	0.03	0.17	0.05	0.23	0.04	0.20

Annexure Table 2

Parameter Estimates of LA/AIDS Model for Pakistan 2010-11

	Wheat	Rice	Other Cereals	Pulses	Fruits and Vegetables	Dairy	Meat	Oil	Sugar	Others
Wheat price	0.1149***	-0.0056***	0.0003	-0.0017**	-0.0308***	-0.0308***	-0.0241***	-0.0037**	-0.0091***	-0.0094***
	(0.0028)	(0.0012)	(0.0005)	(0.0007)	(0.0013)	(0.0016)	(0.0014)	(0.0016)	(0.0014)	(0.0010)
Rice price	-0.0056***	0.0194***	-0.0019***	-0.0025***	-0.0042***	-0.0002	-0.0017**	-0.0056***	0.0041***	-0.0020***
	(0.0012)	(0.0009)	(0.0003)	(0.0004)	(0.0008)	(0.0009)	(0.0008)	(0.0008)	(0.0008)	(0.0006)
Other cereal price	0.0003	-0.0019***	-0.0017***	0.0007***	0.0024***	0.0005	-0.0020***	-0.0005	0.0011***	0.0011***
	(0.0005)	(0.0003)	(0.0002)	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0005)	(0.0003)	(0.0003)
Pulses price	-0.0017**	-0.0025***	0.0007***	0.0205***	-0.0026***	0.0007	-0.0049***	-0.0052***	-0.0039***	-0.0011***
	(0.0007)	(0.0004)	(0.0002)	(0.0005)	(0.0004)	(0.0004)	(0.0004)	(0.0008)	(0.0004)	(0.0004)
Fruit & vegetable price	-0.0308***	-0.0042***	0.0024***	-0.0026***	0.0649***	-0.0060***	-0.0034***	-0.0162***	0.0031***	-0.0071***
	(0.0013)	(0.0008)	(0.0003)	(0.0004)	(0.0012)	(0.0011)	(0.0009)	(0.0009)	(0.0009)	(0.0006)
Dairy price	-0.0308***	-0.0002	0.0005	0.0007	-0.0060***	0.0846***	-0.0091***	-0.0200***	-0.0152***	-0.0046***
	(0.0016)	(0.0009)	(0.0003)	(0.0004)	(0.0011)	(0.0026)	(0.0014)	(0.0009)	(0.0012)	(0.0007)
Meat price	-0.0241***	-0.0017**	-0.0020***	-0.0049***	-0.0034***	-0.0091***	0.0750***	-0.0161***	-0.0046***	-0.0091***
	(0.0014)	(0.0008)	(0.0003)	(0.0004)	(0.0009)	(0.0014)	(0.0016)	(0.0009)	(0.0010)	(0.0006)
Cooking oil price	-0.0037**	-0.0056***	-0.0005	-0.0052***	-0.0162***	-0.0200***	-0.0161***	0.0806***	-0.0080***	-0.0055***
	(0.0016)	(0.0008)	(0.0005)	(0.0008)	(0.0009)	(0.0009)	(0.0009)	(0.0021)	(0.0009)	(0.0008)
Sugar price	-0.0091***	0.0041***	0.0011***	-0.0039***	0.0031***	-0.0152***	-0.0046***	-0.0080***	0.0360***	-0.0034***
	(0.0014)	(0.0008)	(0.0003)	(0.0004)	(0.0009)	(0.0012)	(0.0010)	(0.0009)	(0.0013)	(0.0007)
Other price	-0.0094***	-0.0020***	0.0011***	-0.0011***	-0.0071***	-0.0046***	-0.0091***	-0.0055***	-0.0034***	0.0412***
	(0.0010)	(0.0006)	(0.0003)	(0.0004)	(0.0006)	(0.0007)	(0.0006)	(0.0008)	(0.0007)	(0.0007)
Food expenditure	-0.0413***	-0.0035***	-0.0004	-0.0084***	-0.0119***	0.1534***	-0.0184***	-0.0425***	-0.0069***	-0.0202***
	(0.0018)	(0.0010)	(0.0003)	(0.0004)	(0.0012)	(0.0026)	(0.0018)	(0.0010)	(0.0013)	(0.0007)
Primary	-0.0067***	0.0029***	0.0005**	-0.0003	0.0019**	-0.0004	0.0015	0.0014*	-0.0010	0.0003
	(0.0014)	(0.0008)	(0.0003)	(0.0004)	(0.0010)	(0.0021)	(0.0014)	(0.0008)	(0.0011)	(0.0006)
Secondary	-0.0159***	0.0009	0.0001	0.0005	0.0007	0.0047***	0.0138***	-0.0015**	-0.0024***	-0.0010*
	(0.0012)	(0.0007)	(0.0002)	(0.0003)	(0.0008)	(0.0018)	(0.0012)	(0.0007)	(0.0009)	(0.0005)
High	-0.0272***	0.0025***	0.0009***	-0.0033***	-0.0021*	0.0027	0.0324***	-0.0045***	-0.0002	-0.0012*
	(0.0016)	(0.0009)	(0.0003)	(0.0004)	(0.0011)	(0.0025)	(0.0016)	(0.0009)	(0.0012)	(0.0007)
Farm household	-0.0014	0.0068***	0.0018***	-0.0040***	-0.0114***	0.0389***	-0.0074***	-0.0088***	-0.0089***	-0.0055***
	(0.0016)	(0.0009)	(0.0003)	(0.0004)	(0.0011)	(0.0024)	(0.0016)	(0.0009)	(0.0012)	(0.0007)
Employee	0.0037***	-0.0015**	0.0001	-0.0002	0.0013	-0.0036*	-0.0030**	-0.0008	0.0032***	0.0008
	(0.0013)	(0.0007)	(0.0002)	(0.0003)	(0.0009)	(0.0019)	(0.0013)	(0.0007)	(0.0010)	(0.0005)

Continued—

Appendix Table 2—(*Continued*)

Self-employed	0.0004	0.0040***	0.0001	-0.0019***	0.0032***	-0.0051**	0.0003	0.0008	-0.0007	-0.0010
	(0.0016)	(0.0009)	(0.0003)	(0.0004)	(0.0011)	(0.0024)	(0.0016)	(0.0009)	(0.0012)	(0.0007)
Poor	0.0386***	0.0019**	-0.0003	-0.0029***	-0.0048***	0.0189***	-0.0424***	-0.0050***	0.0025**	-0.0064***
	(0.0013)	(0.0007)	(0.0002)	(0.0003)	(0.0009)	(0.0019)	(0.0013)	(0.0007)	(0.0010)	(0.0006)
Urban	-0.0151***	-0.0031***	-0.0000	-0.0002	0.0026***	0.0022	0.0168***	-0.0010	-0.0084***	0.0060***
	(0.0012)	(0.0007)	(0.0002)	(0.0003)	(0.0008)	(0.0018)	(0.0012)	(0.0007)	(0.0009)	(0.0005)
Quarter 2 (Oct-Dec)	0.0041***	-0.0015*	-0.0004	-0.0009***	-0.0083***	0.0014	0.0155***	-0.0000	-0.0080***	-0.0019***
	(0.0013)	(0.0008)	(0.0003)	(0.0003)	(0.0009)	(0.0020)	(0.0013)	(0.0007)	(0.0010)	(0.0006)
Quarter 3 (Jan-March)	0.0021	0.0020**	-0.0011***	-0.0027***	-0.0039***	0.0107***	0.0021	0.0060***	-0.0141***	-0.0012*
	(0.0015)	(0.0008)	(0.0003)	(0.0004)	(0.0011)	(0.0021)	(0.0014)	(0.0009)	(0.0011)	(0.0006)
Quarter 4 (April-June)	0.0026*	0.0004	-0.0004	-0.0026***	-0.0125***	0.0246***	-0.0087***	0.0070***	-0.0077***	-0.0026***
	(0.0016)	(0.0009)	(0.0003)	(0.0005)	(0.0012)	(0.0021)	(0.0015)	(0.0010)	(0.0012)	(0.0007)
Punjab	-0.0294***	0.0040***	-0.0006	-0.0068***	-0.0233***	0.1636***	-0.0594***	-0.0014	-0.0395***	-0.0071***
	(0.0025)	(0.0014)	(0.0005)	(0.0006)	(0.0017)	(0.0037)	(0.0025)	(0.0014)	(0.0019)	(0.0011)
Sindh	-0.0621***	0.0355***	0.0006	-0.0084***	-0.0365***	0.1419***	-0.0351***	-0.0050***	-0.0380***	0.0071***
	(0.0026)	(0.0015)	(0.0005)	(0.0007)	(0.0018)	(0.0038)	(0.0026)	(0.0014)	(0.0019)	(0.0011)
KPK	-0.0153***	0.0056***	0.0066***	-0.0010	-0.0153***	0.0901***	-0.0522***	0.0039***	-0.0186***	-0.0038***
	(0.0027)	(0.0015)	(0.0005)	(0.0007)	(0.0019)	(0.0040)	(0.0027)	(0.0015)	(0.0020)	(0.0011)
Constant	0.4340***	0.0383***	0.0076***	0.0633***	0.2315***	-0.3556***	0.1297***	0.1777***	0.1703***	0.1031***
	(0.0072)	(0.0039)	(0.0014)	(0.0019)	(0.0049)	(0.0097)	(0.0069)	(0.0042)	(0.0052)	(0.0030)
Observations	15,705	15,705	15,705	15,705	15,705	15,705	15,705	15,705	15,705	15,705
R-squared	0.422	0.130	0.072	0.137	0.278	0.390	0.331	0.409	0.138	

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.

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REFERENCES

Andreyeva, Tatiana, Michael W. Long, and Kelly D. Brownell (2010) *American Journal of Public Health* 100:2, 216–222.

Burki, A. A. (1997) Estimating Consumer Preferences for Food, Using Time Series Data of Pakistan. *The Pakistan Development Review* 36:2, 131–153.

Burney, N. A. and A. H. Khan (1991) Household Consumption Patterns in Pakistan: An Urban-Rural Comparison Using Micro Data. *The Pakistan Development Review* 30:2, 145–171.

Cox, L. and K. Wohlgenant (1986) Prices and Quality Effects in Cross-sectional Demand Analysis. *American Journal of Agricultural Economics* 68, 908–919.

De Hoyos, Rafael E. and Denis Medvedev (2009) Poverty Effects of Higher Food Prices: A Global Perspective Development Prospects Group, World Bank, Washington, DC. (Policy Research Working Paper 4887).

Deaton, A. and L. Muellbauer (1980a) An Almost Ideal Demand System. *American Economics Review* 70, 312–26.

Deaton, A. and L. Muellbauer (1980b) *Economics and Consumer Behaviour*. Cambridge: Cambridge, University Press, UK.

FAO, IFAD, and WFP (2013). *The State of Food Insecurity in the World 2013. The Multiple Dimensions of Food Security.* Rome: FAO.

Farooq, Umar, Trevor Young, and Muhammad Iqbal (1999) An Investigation into the Farm Households Consumption Patterns in Punjab, Pakistan. *The Pakistan Development Review* 38:3, 293–305.

Friedman, Jed, Seo Yeon Hong, and Xiaohui Hou (2011) The Impact of the Food Price Crisis on Consumption and Availability in Pakistan: Evidence from Repeated Cross-sectional and Panel Data. The World Bank, Washington, DC. (HNP Discussion Paper).

Haq, Zahoor, Hina Nazli, and Karl Meilke (2008) Implications of High Food Prices for Poverty in Pakistan. *Agricultural Economics* 39, 477.

Haq, Zahoor, Hina Nazli, Karl Meilke, Muhammad Ishaq, Amjad Khattak, Arshad H. Hashmi, and Fasih Ur Rehman (2011) Food Demand Patterns in Pakistani Punjab. *Sarhad Journal of Agriculture* 27:2.

Harttgen, Kenneth and Stephan Klasen (2012) Analysing Nutritional Impacts of Price and Income Related Shocks in Malawi and Uganda. United Nations Development Programme. (WP 2012-014).

Ivanic, M. and W. Martin (2008) Implications of Higher Global Food Prices for Poverty in Low-income Countries. *Agricultural Economics* 39:1, 405–416.

Malik, S. J., Hina Nazli, and Edward Whitney (2014a) The Official Estimates of Poverty in Pakistan—What is Wrong and Why?—Illustrations using the Government of Pakistan's Household Integrated Economic Survey 2010-11. Pakistan Strategy Support Program of International Food Policy Research Institute: Islamabad. (PSSP Working Paper (forthcoming)).

Malik, Sohail J. and Nadeem Sarwar (1993) Some Tests for Differences in Consumption Patterns: The Impact of Remittances Using Household Income and Expenditure Survey 1987-1988. *The Pakistan Development Review* 32:4, 699–711.

Muellbauer, J. (1976) Community Preferences and the Representative Consumer. *Econometrica* 44:5, 525–543.

Pakistan, Government of (2001) *Food Composition Table for Pakistan*. Peshawar: Department of Agricultural Chemistry, NWFP Agriculture University.

Pakistan, Government of (2011a) *Agriculture Statistics of Pakistan 2010-11*. Islamabad: Pakistan Bureau of Statistics.

Pakistan, Government of (2011b) *Change in Cost of the Food Basket 2010-2011*. Islamabad: Nutrition Section, Planning and Development Division, Government of Pakistan.

Pakistan, Government of (2012) *National Nutrition Survey of Pakistan 2010-11*. Islamabad: Aga Khan University's Division of Women and Child Health, Pakistan's Ministry of Health and UNICEF.

Pakistan, Government of (2013) *Economic Survey 2012-13*. Islamabad: Ministry of Finance.

Pakistan, Government of (2014) *Economic Survey 2013-14*. Islamabad: Ministry of Finance.

Pakistan, Government of (Various Issues) *Household Integrated Economic Survey*. Islamabad: Pakistan Bureau of Statistics.

Pollack, A. and Wales, J. (1981) Estimation of Complete Demand Systems from Household Budget Data: The Linear and Quadratic Expenditure Systems. *The American Economic Review* 68, 348–359.

Regmi, Anita and James L. Seale, Jr. (2010) Cross-price Elasticities of Demand Across 114 Countries. United States Department of Agriculture. (Technical Bulletin No. 1925).

Shamim, Farkhanda and Etzaz Ahmad (2007) Understanding Household Consumption Patterns in Pakistan. *Journal of Retailing and Consumer Services* 14, 150–164.

Siddiqui, Rehana (1982) An Analysis of Consumption Patterns in Pakistan. *The Pakistan Development Review* 21:4, 275–296.

World Bank (2006) *Repositioning Nutrition as Central to Development: A Strategy for Large-Scale Action.* Washing, DC.: The World Bank.

World Bank (2010) Food Price Increases in South Asia: National Responses and Regional Dimensions. South Asia Region, Sustainable Development Department, Agriculture and Rural Development Unit, The World Bank.

Zellner, A. (1963) Estimators of Seemingly Unrelated Regression: Some Exact Finite Sample Results. *J. Am. Stat. Ass.* 58, 977–992.

Comments

- The study has investigated the food consumption patterns, and has estimated the income and price elasticities by using Linear Approximate Almost Ideal Demand System (LA-AIDS) by controlling the poverty status, seasonality regional and provincial differences while estimating the demand patterns.
- The results are very interesting that purchasing power in terms of wheat purchase for both the skilled and unskilled labour has declined by taking the case study of Lahore.
- The paper is well-written and has detailed the objectives in a very comprehensive and fabulous way. I just have some comments;
- The paper has drawn important analysis of per capita food availability that though the average per capita calorie intake increased from 2078 to 2450 during 1949-2012 period but half of the population is still unable to meet its caloric intake so access and food inequity is still an issue for majority of population. You also have converted the quantities into calories as given in Table 2 My first question (though it may not be relevant to the authors finding), did official poverty line (need base approach) is not capturing this deprivation and should we need to re-base it?
- In Table 1 you have given food budget shared by food groups. What you find the major change in consumption pattern if you link it with previous studies as you mentioned [Siddiqui (1982); Burney and Khan (1991); Malik and Sarwar (1993); Burki (1997); Farooq, *et al*. (1999); Shamim and Ahmad (2007); Haq, *et al.* (2008, 2011)].
- You estimated average calories intake 2260 (2535 for non-poor and 1848 for poor) for 2010 as given in table 2 but in introduction you mentioned 2450 in 2012 as reported by GoP. So what you comment on it.
- In annexure 1, you have reported 40 percent poverty so I think you have not followed the official so how you come to this number.
- The author found interesting results in Table 3 both encouraging and discouraging that poor in both rural and urban get calories at low cost than non-poor however, wheat is expensive for poor in both rural and urban which around 50 percent caloric share and around 20 percent budget share. So what the items then poor is getting at low price?

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