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Issues in the Measurement and Construction of the Consumer Price Index in Pakistan

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I. INTRODUCTION

The Consumer Price Index (CPI) is one of the most important measures used in economic analysis. The more common uses are: the indexation of wages, rents, contracts and social security payments; the deflation of household consumption in the national accounts; and as a general macroeconomic indicator, especially for inflation targeting and for setting interest rates. Elements of a CPI are also often used in the calculation of purchasing power parities (PPPs) required in the International Comparison Program (ICP) (UN, 2009). As such it also has very significant political implications when the performance of the governments is assessed in terms of real growth, inflation and poverty reduction.

This paper examines the measurement and construction of the Consumer Price Index in Pakistan. With the help of the data from Household Integrated Economic Surveys (HIES) of the Government of Pakistan, and the recently collected data of Rural Household Panel Survey under the Pakistan Strategy Support program, this paper examines identifies some serious issues in the measurement and construction of the CPI in Pakistan. Differences in the consumption patterns and prices faced by rural and urban households not explicitly accounted for in the CPI and the respective weights of different commodity groups used are highlighted as issues for serious concern.

This paper is divided into five sections. Section 2 introduces the concept and explains the methodology used for computing the CPI in Pakistan. Section 3 provides the evidence about the issues in measuring the CPI. Conclusions are presented in Section 4 and policy recommendations and way forward in Section 5.

2. THE CONSUMER PRICE INDEX (CPI)

The CPI measures changes in the cost of a representative basket of goods and services. Two factors are important in the computation of the CPI: i) weights of consumption items, and ii) retail prices. Weights are usually computed from Family Budget Surveys. Such surveys collect information on the expenditure on the goods and services consumed by the representative population. The item classification is increasingly based upon an international standard classification called the Classification of Individual Consumption according to Purpose (COICOP). The COICOP was first developed for the United Nations System of National Accounts (SNA 1993) to provide the structure for classifying household consumption expenditure. Expenditures on the various components, including goods and services, of household consumption are often used as the basis for the weights in the CPI. The 2003 ILO Resolution on CPIs requires that national CPI classifications should be reconcilable with COICOP. Table 1 provides the list of goods and services under COICOP.

Table 1: Distribution of commodity groups between goods and services according to COICOP

Commodity groups	Good	Services
Food & Non-alcoholic Beverages	11	0
Restaurants & Hotels	5	0
Alcoholic Beverages & Tobacco	4	2
Clothing & Footwear	7	8
Furnished Household Equipment & House	9	3
Housing, Water, Electricity, Gas, other	3	4
Health	6	8
Transport	1	2
Communication	14	7
Recreation & Culture	0	5
Education	0	3
Miscellaneous Goods & Services	4	11
Total	64	53
Total Goods and Services	117	

The consumption weights play an important role in the computation of CPI. The COICOP demands high quality weights, in respect of both timeliness of data and accuracy. The Operational Manual has the following remark concerning the timeliness of the underlying data from which the weights are computed: “If the [most recent Household Budget Survey] is more than 10 years old, you will need to make it up-to-date by adjustments to survey data reflecting changes in demography or expenditure patterns”. The ILO Resolution on CPI states that “weights should be reviewed and if appropriate revised as often as accurate and reliable data are available for this to be done, but at least once every five years.” (UN, 2009)

3. THE CONSUMER PRICE INDEX IN PAKISTAN

The Pakistan Bureau of Statistics (PBS) is responsible for computing and disseminating the Consumer Price Index (CPI) and inflation rate in Pakistan. In this regard, data of Family Budget Survey and price survey are used. The Family Budget Survey is conducted after every five years and price survey collects data every month on several goods and services. Both these surveys are conducted in urban areas. Although the computation of CPI is based on a systematic and international standard method¹, the survey methodology in Pakistan to collect information on the basket of goods and services and commodity prices suffer from two major problems. First, the information on the basket of goods and services, prices are collected only from urban areas, rural areas are ignored². Second, the survey methodology, survey instruments, and primary data have never been released and as such it is impossible to assess its quality and reliability with any rigorous scientific methods.

To collect the information on the basket of goods and services, a Family Budget Survey is conducted in Pakistan after a five-year interval. The latest survey was conducted in 2007-08, covered 54,309 households in 65 cities³. This survey collected information on 487 items that reflect the latest consumption pattern. Table 2 reports the weights of 12 commodity groups⁴. This table shows that the share of four commodity groups, food, housing, clothing and footwear contribute 79 per cent to total expenditure. The share of food group is highest (34.83%) followed by housing (29.41%), clothing and footwear (7.57%), and transport (7.2%). A list of items falling in 12 commodity groups is given in Appendix Table 4.

In addition, the PBS collects data on prices from 40 urban centers. In each urban center, 1 to 13 markets are surveyed and in each market, four quotations are obtained. The CPI is computed using the Laspeyre’s formula:

$$I_n = \frac{\sum \frac{P_n}{P_o} w_i}{\sum w_i} * 100$$

Where

I_n = CPI for the n^{th} period

P_n = price of item i in the n^{th} period

P_o = price of item i in the base period

w_i = weight of the item i in the base period, where is calculated as: $\frac{P_o Q_o}{\sum P_o Q_o}$ and

$\sum w_i$ = total weight of all items

¹ Like many other countries, Pakistan has adopted COICOP in the most recent Family Budget Survey.

² Explaining the selection of urban centers to collect price information, the PBS states that several of the items included in the consumer basket are not marketed in rural areas and the prices of other items are more or less same in rural and urban areas. Therefore, prices are collected from urban centers (see GOP, 2011, Monthly Review of Prices Indices, October 2011).

³ The next one was due to be conducted in 2012. However, it is not known if this was actually done.

⁴ These commodity groups are based on the Classification of Individual Consumption according to Purpose (COICOP).

Table 2: Commodity groups and their weight in total household budget (Family Budget Survey 2007-08)

Commodity groups	% share
Food & Non-alcoholic Beverages	34.83
Restaurants & Hotels	1.23
Alcoholic Beverages & Tobacco	1.41
Clothing & Footwear	7.57
Furnished Household equipments & House	4.21
Housing, Water, Electricity, Gas, other	29.41
Health	2.19
Transport	7.20
Communication	3.22
Recreation & Culture	2.02
Education	3.94
Miscellaneous Goods & Services	2.76
Total	100

Source: GOP (2011)

4. ISSUES IN THE MEASUREMENT OF CONSUMER PRICE INDEX IN PAKISTAN

In the previous section three main issues were identified. These are: i) difference in consumption pattern between urban and rural areas are not accounted for, ii) due to the exclusion of rural areas, weights of some commodities are understated and others are overstated, and iii) differences in the retail prices between urban and rural areas and across provinces are not taken into account. Empirical evidence is provided to highlight these three issues in this section.

4.1 Differences in consumption patterns

The average monthly consumption expenditure reported by the HIES since 2001-02 are reported in Table 3. All these years show significant differences between the urban and rural areas. Urban households spend a larger amount than the rural households. For example, in 2007-08, on average, urban households spent Rs 4,473 more than the rural households each month. This difference was Rs 7,040 per month in 2010-11. This indicates either their basket of goods and services is different or they face higher prices than their rural counterparts.

Table 3: Average monthly consumption expenditure by urban and rural areas (Rs/month)

Year	Urban	Rural	Difference
2010-11	23,959	16,919	7,040
2007-08	15,601	11,128	4,473
2005-06	13,997	8,945	5,052
2004-05	12,079	7,712	4,367
2001-02	8,997	5,766	3,231

Source: HIES (various issues)

4.2 Differences in budget shares

The budget shares of different commodity groups reported by the PBS from Family Budget Survey with the budget shares computed from HIES 2007-08 are presented in Table 4. The table shows that the share of food and non-alcoholic

beverages is 10 percentage points higher in HIES 2007-08 than that is reported by the Family Budget Survey 2007-08. Looking at very recent year (2010-11), food accounts for nearly 49 percent in total expenditure; 13.94 percentage points higher than the Family Budget Survey 2007-08.

The disaggregation of budget shares by urban and rural areas indicates that the share of food in rural areas is 13.79 percentage points higher than that is in urban areas and the share of housing is 10.66 percentage points higher in urban areas as compared to rural areas. This result reinforces the result derived from Table 3. It is important to note that the items with higher weights have greater impact on CPI than those with lower weights. An increase in the price of an item that has larger share in household budget may increase the value of CPI significantly. However, an increase in price and reduction in the budget share may have insignificant effect. The data of Family Budget Surveys is collected only from urban areas where the share of food in household budget is much lower than that is in rural areas. In view of the results of nationally representative household surveys, the possibility of a downward bias in the calculation of food inflation cannot be ignored.

Table 4: Percent share of different food groups in total expenditure

Food groups	Family Budget 2007-08	HIES 2007-08		
		Pakistan	Urban areas	Rural areas
Food and Non-alcoholic Beverages	34.83	43.61	36.82	50.6
Restaurants and Hotels	1.23	0.97	1.27	0.67
Alcoholic Beverages & Tobacco	1.41	1.12	0.82	1.44
Clothing and Footwear	7.57	6.62	5.87	7.38
Furnished Household Equipments & House	4.21	2.80	3.24	2.36
Housing, Water, Electricity, Gas, other	29.41	23.61	28.86	18.20
Health	2.19	3.69	3.12	4.27
Transport	7.20	8.26	8.34	8.19
Communication	3.22	2.21	2.66	1.75
Recreation & Culture	2.02	2.15	2.86	1.42
Education	3.94	2.33	3.32	1.30
Miscellaneous Goods & Services	2.76	2.63	2.82	2.43
Total	100	100	100	100

Source: GOP (2011) and HIES (2007-08)

The results from the HIES 2007-08 is supported by not only by the HIES 2010-11 but also the recently conducted Rural Household Panel Survey 2012 (referred to as "RHPS (2012)"). This latter survey covered rural areas of 19 districts in Punjab, Sindh, and KPK. This survey found that rural households spend nearly 57 percent on food.

4.3 Differences in prices in urban and rural areas

As indicated earlier the prices used to compute the CPI are collected from 40 urban centers. However, prices may across rural and urban areas. The commodities such as, unprocessed or semi-processed agricultural products that are produced in rural areas may be cheaper in rural areas as compared to urban areas. However, processed products or the products transported from other districts or provinces may be expensive in rural areas. The HIES does not collect data on prices separately. However, households are asked to report the per unit price of food items that they consume. The prices of selected food items by urban and rural areas of Pakistan are reported in Table 5. This table shows significant differences in the prices of several food items. Most of the items that are produced in rural areas, such as, cereals, pulses, meat, and milk are more expensive in urban areas. The processed items, such as, edible oil/ghee, and sugar are more expensive in rural areas.

Table 5: Prices of selected food items by urban and rural areas of Pakistan

Food items	Urban	Rural	t-test
Cereals			
Wheat and Wheat flour	29.8	28.5	21.78*
Rice and Rice flour	63.7	58.8	17.21*
Pulses			
Gram (black and white)	80.2	79.8	1.82***
Mash	162.6	163.4	-1.15
Moong	135.4	135.8	-0.99
Masoor	132.0	133.0	-1.73
Milk and Milk Products			
Milk	49.4	44.6	29.88*
Yogurt	59.0	49.8	28.09*
Oil and Ghee			
Banaspati ghee	149.6	150.2	-1.59
Cooking oil	150.6	153.5	-4.17*
Meat			
Beef	234.7	222.5	12.86*
Mutton	409.4	394.7	5.35*
Vegetables			
Potatoes	26.8	27.5	-4.37*
Onion	32.8	34.4	-5.99*
Fruits			
Banana	32.1	30.8	4.80*
Sweeteners			
Sugar	74.3	76.5	-14.29*

Source: HIES (2010-11)

The RHPS (2012) collected data on the prices of different food items at retail level from district, UC, and village markets for three provinces. Table 6 presents price differentials across these markets within a province. This table shows significant price differentials across markets within a province. Prices of wheat flour, rice, milk, and milk products are significantly higher in district markets (or urban markets) than the UC and *mauza* markets (rural markets). No significant difference in the prices of pulses, fruits and vegetables, meat and poultry, edible oil and ghee, and sugar has been observed. However, significant provincial differences in the prices of food items can be observed from this table⁵.

⁵ Levels of significance are not reported here.

Table 6: Prices of selected food items at district, UC, and Mauza levels in Punjab, Sindh, and KPK (Rs/Kg)

Food items	Prices in Punjab (Rs/Kg)				Prices in Sindh (Rs/Kg)				Prices in KPK (Rs/Kg)			
	District market	UC market	Mauza market	F-test	District market	UC market	Mauza market	F-test	District market	UC market	Mauza market	F-test
Cereals												
Wheat	26.6	26.4	26.0	0.61	27.8	27.5	26.4	1.13	23.0	23.0	23.7	0.294
Wheat flour	32.2	31.0	30.8	4.23*	32.2	32.1	31.2	1.01	29.6	29.2	29.7	0.499
Rice	86.4	81.4	78.2	2.93*	79.4	63.2	61.3	7.93*	69.6	64.6	64.4	0.088
Pulses												
Gram	113.2	110.6	110.3	0.16	110.3	107.4	97.0	1.28	119.4	120.0	123.1	0.064
Moong	125.8	127.7	130.3	0.49	138.4	135.5	138.6	0.09	110.6	111.9	115.0	0.982
Masoor	112.8	117.8	121.8	2.09*	123.8	125.3	104.4	1.72***	87.5	85.8	86.7	0.074
Milk and Milk Products												
Milk	56.1	49.8	45.7	22.84*	59.3	58.0	55.9	0.361	64.4	64.4	62.3	0.125
Yogurt	65.2	62.7	59.9	3.99*	71.2	71.8	67.5	0.534	64.0	62.0	62.0	0.286
Oil and Ghee												
Banaspati ghee	180.6	181.8	182.3	0.20	174.4	170.6	167.9	1.238	170.6	172.1	172.1	0.022
Cooking oil	182.7	186.9	187.5	1.03	182.9	181.7	174.1	1.048	166.8	169.8	172.2	0.295
Meat and Poultry												
Beef	234.7	235.2	234.5	0.01	232.2	242.3	218.6	1.453	302.0	302.0	230.0	1.455
Mutton	458.1	462.8	445.5	0.86	393.7	394.6	458.3	2.689	428.0	417.5	380.0	2.147
Chicken	226.5	230.2	233.0	0.49	228.2	233.8	238.9	0.537	161.7	167.5	169.2	0.034
Vegetables and Fruits												
Potatoes	19.6	20.9	20.4	0.33	18.9	19.6	20.0	0.505	21.7	22.4	23.6	0.705
Onion	30.8	32.8	32.5	0.98	24.6	24.6	26.4	0.309	30.0	31.0	32.1	0.078
Banana	48.3	51.3	51.9	0.59	38.4	40.4	41.0	0.026	43.5	47.6	50.0	2.130
Sweetners												
Sugar	56.6	57.2	58.0	1.01	62.0	60.4	59.6	0.790	55.1	55.9	58.6	11.051

Source: RHPS (2012).

Notes: *, **, *** denote statistical significance at the one percent, five percent and ten percent levels, respectively.

5. CONCLUSIONS

Three main conclusions can be drawn from the analysis presented in the previous section. First, significant differences exist between the consumption baskets of rural and urban households. Second, the share of food expenditure in total household expenditure is significantly large and accounts for nearly half of total expenditures. Third, significant differences exist in the retail prices across rural and urban areas for some food items.

These conclusions indicate the possibility of measurement bias in the CPI of Pakistan. The UN (2009) states “As far as regional coverage of the CPI is concerned, the general rule is that a national CPI should cover expenditures and prices throughout the country. However, comprehensive coverage is not always necessary; especially if regional CPIs are not published; and, the sampling scheme ensures that the index is representative of the whole country” (UN, 2009, pp 10). The CPI of the United States reflects the spending patterns of two population groups: all urban consumers, and urban wage earners and clerical workers. The all urban consumer group represents about 87 percent of the total U.S. population (Bureau of Statistics, 2007). India compiles CPI for both urban and rural areas in each state. The national level CPI is computed by merging urban and rural CPIs with appropriate weights (Government of India, 2010).

The coverage of CPI in Pakistan is limited to urban areas only and ignores the rural population that constitutes 60 percent of total population. According to the State Bank of Pakistan (2001), the CPI may not reflect the household whose expenditure pattern differs substantially from the “average urban consumer”. The CPI does not cover all the segments of population and therefore, does not reflect the true picture of the price behavior in the country as a whole. The possibility of measurement bias cannot be ignored in the CPI of Pakistan. Most of this bias comes from consumption weights.

6. POLICY RECOMMENDATIONS AND WAY FORWARD

This paper identifies the use of non-representative consumption weights as the major source of measurement bias in the present methodology of CPI.

Very little can be said on how best to improve the current methodology beyond stating that it should NOT underrepresent the weight of food and that it should give appropriate representation to rural consumption patterns and prices.

At present, the consumption weights are drawn from the Family Budget Survey that covers more than 54,000 households in 60 cities of Pakistan. However, these data have never been released and the report was never published. No one knows the sampling framework and coverage of the survey. The questionnaire is not in the public domain. Similarly, the sampling framework of selecting markets to collect data on prices is never disclosed. The only available information is that the markets are selected on the basis of the volume of sales, assuming that majority of the consumers buy goods from these markets and PBS collects price data on monthly basis according to a predetermined time schedule. The PBS should follow the ILO resolution that states that “in order to ensure public confidence in the index, a full description of the data collection procedures and the index methodology should be prepared and made widely available” and that “The documentation should include a discussion of the accuracy of the index estimates” (UN, 2009, pp 188).

As discussed earlier, the other available data sets indicate pronounced differences in various economic, social, and demographic factors across urban and rural areas. In addition, differences in prices across provinces and rural-urban areas also exist. There is a need, therefore, to revise the methodology of the CPI by taking into account the consumption pattern of all segments of the population. We suggest a full representation of provinces and urban rural areas. However, conducting a large scale survey with regional and provincial representation may not be cost efficient. The Household Integrated Economic Survey, conducted by the PBS is a regular feature. This survey also includes a large module on consumption expenditure. However, the items listed in this module are not in line with the international standard classification, Classification of Individual Consumption according to Purpose (COICOP). Making the Family Budget Survey a part of the HIES can be more efficient not only in terms of cost but also in terms of time. This exercise can also be helpful in the frequent updating of the consumption weights. In addition, the measurement bias in prices can be removed by including a price module in the community questionnaire of HIES to cover rural communities⁶. Rural markets can be identified using appropriate technique. This specific module can be conducted on a monthly basis.

⁶ The community questionnaire of HIES is administered only in rural areas.

The report of the Boskin Commission, 1996⁷, identified four sources of possible bias:

- *Substitution bias* occurs because a fixed market basket fails to reflect the fact that consumers substitute relatively less for more expensive goods when relative prices change.
- *Outlet substitution bias* occurs when shifts to lower price outlets are not properly handled.
- *Quality change bias* occurs when improvements in the quality of products, such as greater energy efficiency or less need for repair, are measured inaccurately or not at all.
- *New product bias* occurs when new products are not introduced in the market basket, or included only with a long lag.

There is a need to examine the presence and extent of these biases. To ensure the accuracy of CPI, it is important to update and modify the methodology to measure CPI in Pakistan.

⁷ The Boskin Commission, formally called the "Advisory Commission to Study the Consumer Price Index", was appointed by the United States Senate in 1995 to study possible bias in the computation of the CPI in the United States.

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