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DECOMPOSITION OF INFLATION IN PAKISTAN AND ITS IMPLICATIONS FOR DIFFERENT INCOME QUINTILES

Shagufta ANDLEEB* and Eatzaz AHMAD**

Abstract

This study analyses the commodity group-wise composition of CPI inflation rate and its implications for different income groups in Pakistan during January 1997 to January 2024. It is found that food inflation is the major component of inflation, and its contribution to overall inflation further increases during the periods of high inflation rates. Furthermore, during periods of high inflation, the inflation rate faced by lower-income groups has been systematically higher. The study concludes that the double-digit inflation in Pakistan has an impact similar to that of regressive income tax, amounting to low-income households subsidising higher-income households.

Keywords: Inflation, Decomposition, Price Level, Deflation.
JEL Classification: E310.

I. Introduction

Inflation is a critical issue not only for economists but also for policymakers, mainly because rising prices can erode the living standards of households. Even though some economists, such as Ilie and Florin (2011), Grignoli and Serban (2018) and Humpage (2008), suggest that the negative impact of inflation is more sociological than monetary, there are tangible reasons to believe the contrary. First, with nominal wage rigidities due to overlapping wage contracts, households' nominal incomes lag behind the rising price level, resulting in reduced real incomes. In countries where inflation is a persistent phenomenon, a significant fraction of households will always suffer losses in real income.

Second, while all households face a similar increase in prices, their nominal incomes do not increase in equal proportion or with equal time lags due to the differences in labour market conditions and different sources of financing household budgets. Third, during inflation, prices of some goods rise by a greater percentage than the prices of other goods. Hence, the impacts of inflation on households' living standards

* Research Scholar**, Professor, Iqra University, Islamabad, Pakistan.

depend on the composition of their consumption baskets. If inflation is caused by supply shocks in commodity markets, for example, due to crop failures or climate change, the prices of basic food items will rise at a greater percentage than the prices of other goods. In this case, even if nominal income rises at the same rate as the overall inflation rate, the purchasing power of low-income households, who spend a greater percentage of their income on food, will decline.

In developing countries, the primary reason inflation is considered undesirable is its adverse impact on households' real income, rather than the uncertainty it creates for decision-making. To this end, the literature mostly relies on the Consumer Price Index (CPI) represented by the Laspeyres price index, in which prices of consumer goods relative to the respective prices in a base period are averaged using weights derived from the representative consumption basket of the base period.[1] Although it is often argued that the GDP deflator is a more comprehensive measure of the aggregate price level than the CPI, it may not be preferred due to its serious shortcomings. Specifically, GDP includes the prices of exported goods that are not consumed in the country under consideration, while it excludes the prices of imported goods that are consumed in the country and are often the main component of inflation (Ahmad & Ram, 1991; Bureau of Labour Statistics, 2016).

In Pakistan, like many other developing countries, inflation is one of the persistent issues (Nawaz et al., 2017; Chaudhary et al., 1995). The data from the Pakistan Economic Survey show that, over the past 50 years, the annual inflation rate in Pakistan has never been less than 2 per cent, while it has crossed the double-digit mark in 20 years. Most empirical work on inflation in Pakistan analyses the causes or sources of inflation (Ahmad & Ali, 1999; Khan et al., 1996; Saleem et al., 2015). These studies focus on overall inflation or occasionally on food and oil price inflation. The general conclusion is that expansionary monetary stance and cost-push factors are the dominant factors contributing to inflation in the long run.

Saleem et al. (2015) find a strong correlation between changes in oil prices and inflation in Pakistan, especially when oil prices are on a continuous rising trajectory. Hanif et al. (2017) observe that global oil price hikes cause inflation in Pakistan's administered prices.[2] Moreover, non-food prices, while changes in global commodity prices largely affect food inflation. Thus, variations in worldwide commodity prices have a substantial impact on inflation in Pakistan. Qayyum and Sultana (2018) analyse the contribution of various factors towards food inflation and conclude that increases in GDP, food exports, food imports and taxes contribute to inflation, while the increase

[1] In an earlier variant of Laspeyres price index, namely Lowe price index, the weights are derived from the representative consumption basket of a reference period, which may or may not be the same as the base period. More details on the early history of index numbers are available in Diewert (1993).

[2] Administrative prices mean prices of certain essential goods (such as petroleum products, electricity and natural gas in Pakistan) regulated through the government's authorities in order to minimise or spread over time the impacts of major supply and demand shocks.

in money supply helps control inflation. These hard-to-interpret conclusions are most probably the result of poor model specification and the absence of many important variables from the estimated equation.

Only a few studies in Pakistan analyse the structure of inflation and its implications for different income groups, especially people with low incomes. Hanif (2012) observes that food inflation in Pakistan contributed about 50 per cent to the overall inflation rate. The study further observes that during the commodity price shocks of 2008, a few basic food items, namely wheat, sugar, meat, fresh milk, and vegetables, accounted for half of the food inflation. Based on this information and the observation that the wage increases did not keep pace with food inflation, the study concludes that inflation caused by global factors has affected poor households more than the rich. Nawaz et al. (2017) also find that poor households and those with fixed incomes are disproportionately affected by inflation.

Idrees et al. (2022) analyse both primary and secondary data for the province of Sindh, observing that low-income groups are adversely affected by counter-inflationary government policies, but not by inflation itself. Similarly, Rehman et al. (2015) point out that poor households are adversely affected by inflation because government subsidies are negatively correlated with food prices. In another recent study, Suleman et al. (2022) observe that a sudden increase in the prices of food products and other essential consumer goods during the COVID-19 period had caused an increase in the poverty rate.

However, empirical literature on the contribution of different consumption categories, such as food, housing, fuel, and lighting, to overall inflation in Pakistan is limited. For example, no study has explored the relative contribution of food inflation to the overall inflation during the periods of high and low inflation rates, and there is no empirical work that formally tests the difference in inflation rates faced by different income groups.

In light of the above observations, the objective of this study is to quantify and analyse the contributions of price inflation across various broad categories of consumer goods to the overall inflation rate, with a particular focus on food inflation. The study explores whether the contribution of food inflation to the overall inflation rate is systematically higher during the periods of higher inflation rates. Finally, the study formally tests the difference in inflation rates faced by different income groups. The findings of this study will be useful for designing pricing policies by various regulatory authorities, with a special focus on protecting poor households whose consumption baskets are dominated by basic food items. The findings will also have implications for tax policies on various categories of goods and services.

These research objectives are important in the context of the prevailing economic situation in Pakistan, where high budget and current account deficits have forced Pakistan to continue relying on external borrowing, especially from the IMF, and implement structural reforms that necessitate the removal of subsidies and price controls. The rising current account deficit has also caused currency depreciation, thereby further

fueling inflation. These factors not only contribute to overall inflation but also cause changes in the relative prices of various categories of goods, which in turn have diverse impacts on different income groups.

Addressing the above objectives requires decomposing the overall price level into its broad components, such as the price levels of food, fuel, housing, and other categories of essential goods and services. To accomplish this task, the study relies on the additivity property of the Laspeyres price index, which states that the overall price level can be expressed as the weighted sum of the price levels of its sub-categories, where the weights are budget shares of the corresponding sub-categories of goods. Nordhaus and Shoven (1977) follow this approach and explain the technique of decomposing the wholesale price index (an application of the Laspeyres price index). More recent studies on the decomposition of inflation, including First and Hao (2023), Shapiro (2024), and Ybrayev et al. (2024), analyse the contributions of demand and supply factors to inflation, with a focus on external supply shocks such as oil and commodity price hikes. This work is only partially relevant to our objectives because our focus is more on the structure of inflation with respect to the decomposition of consumption baskets of households in general and those falling in the top and bottom income categories.

Once the price level is decomposed, it also becomes possible to relate the overall inflation rate to inflation rates of the sub-categories. The analytical framework based on this decomposition relies on the tools of descriptive statistics and simple statistical tests of differences between means without any use of regression analysis.

The rest of the study is organised as follows. Section II presents an analytical framework comprising the mathematical structure of the decomposition of the price level and inflation rate, as well as an empirical approach and the relevant data. Section III presents the results, and Section IV concludes the study.

II. Analytical Framework

The analytical framework employed in this study exploits some well-known properties of the Laspeyres price index (used for the estimation of CPI) to decompose the overall price index into the price indices of various categories of consumer goods and services. This price index was introduced in 1871 by the German economist and statistician Ernst Louis Étienne Laspeyres. Despite multiple limitations, such as failing to fulfil time reversal, factor reversal, and transitivity properties, and overestimating the inflation rate due to ignorance of cross-substitution effects, the Laspeyres price index remains popular for estimating the inflation rate for consumers, the main reason being its simplicity and common-sense appeal.[3] Some other index numbers that fulfil more properties, like Fisher's Ideal index and Divisia index, do not have a straightforward interpretation.

[3] See Braithwait, 1980 and Diewert et al. (2010) for the properties of various types of index numbers.

Another advantage of the Laspeyres price index is that, being a weighted arithmetic mean of price relatives, it is additively decomposable. Hence, it is possible to decompose the overall inflation rate into the inflation rates of various commodity groups and explain their contributions to the overall inflation rate. This decomposition is also useful in analysing how the contributions of various commodity groups, specifically food, differ across episodes of high and low inflation rates and across various income groups of households and, hence, to quantify the differential impacts of inflation on various income groups.

Although other price indices can also be decomposed, their decomposition is inconvenient for the purpose of analysis. For example, the GDP deflator is a Paasche price index, which is a harmonic index or weighted harmonic mean of price relatives with weights equal to expenditure shares in the current period. The overall price index can be expressed as a weighted harmonic mean of the price indices of broad categories of goods. This information is not appealing for decomposition not only because formula for the harmonic mean is non-additive, but also because the weights are not fixed as in the Laspeyres price index. Coming to Fisher's Ideal price index, since it is the geometric mean of the Laspeyres and Paasche price indices, its decomposition poses even more complications. Likewise, since the Divisia price index is a geometric mean of price relatives with variable weights, it is also not decomposable in a straightforward way.

1. Decomposition of Price Level and Inflation Rate

To understand the structure of inflation, we begin with the general CPI, based on the well-known formula for the Laspeyres price index for period *t*, with period zero as the base period. For the structural decomposition, we split the index into its components, consisting of *m* commodity groups. Denoting the price of good (or service) *i* in periods *t* and 0 by P_i^t and P_i^0 respectively, the quantity of good (or service) *i* consumed in period 0 by Q_i^0 and the goods belonging to a specific commodity group *j* by $i \in G_j$, for $j = 1, ..., m$, we can write in Equaion (1):

$$P^t = \frac{\sum_i P_i^t Q_i^0}{\sum_i P_i^0 Q_i^0} = \frac{\sum_{i\in G1} P_i^t Q_i^0 + \ldots\ldots + \sum_{i\in Gm} P_i^t Q_i^0}{\sum_i P_i^0 Q_i^0}$$

$$P^t = \frac{\sum_{i\in G1} P_i^0 Q_i^0}{\sum_i P_i^0 Q_i^0} \frac{\sum_{i\in G1} P_i^t Q_i^0}{\sum_{i\in G1} P_i^0 Q_i^0} + \ldots\ldots + \frac{\sum_{i\in Gm} P_i^0 Q_i^0}{\sum_i P_i^0 Q_i^0} \frac{\sum_{i\in Gm} P_i^t Q_i^0}{\sum_{i\in Gm} P_i^0 Q_i^0} \quad (1)$$

Or, denoting the share of group *j* in total expenditure in the base period by $S_{G_j}^0$ and CPI of group *j* by $P_{G_j}^t$, we can write the overall CPI as the weighted average of the CPIs of commodity groups, where the weights are the expenditure shares in the base period, as follows in Equation (2):

$$P_t = S^0_{G_1} P^t_{G_1} + \ldots . + S^0_{G_m} P^t_{G_m} \tag{2}$$

The next step is to decompose the overall inflation rate into the inflation rates of commodity groups. Assuming that the inflation rate is measured with the interval of *p* lags (for example, p = 12 for the year-to-year inflation rate for each month), the overall inflation rate can be split into commodity group components as follows in Equation (3):

$$\begin{aligned} \pi^t &= \frac{P^t - P^{t-p}}{P^{t-p}} = \frac{(S^0_{G_1} P^t_{G_1} + \ldots . + S^0_{G_m} P^t_{G_m}) - (S^0_{G_1} P^{t-p}_{G_1} + \ldots . + S^0_{G_m} P^{t-p}_{G_m})}{P^{t-p}} \\ &= \frac{S^0_{G_1} P^{t-p}_{G_1}}{P^{t-p}} \left(\frac{P^t_{G_1} P^{t-p}_{G_1}}{P^{t-p}_{G_1}} \right) + \ldots . + \frac{S^0_{G_m} P^{t-p}_{G_m}}{P^{t-p}} \left(\frac{P^t_{G_m} - P^{t-p}_{G_m}}{P^{t-p}_{G_m}} \right) \end{aligned} \tag{3}$$

Equation (3) shows that the terms outside the brackets are the shares of various commodity groups in the overall CPI in period t-p, while the terms inside the brackets are inflation rates of the respective commodity groups. Denoting these shares and inflation rates by $w^{t-p}_{G_j}$ and $\pi^t_{G_j}$ respectively, we obtain in Equations (4), (5) and (6):

$$\pi^t = W^{t-p}_{G_1} \pi^t_{G_1} + \ldots . + W^{t-p}_{G_m} \pi^t_{G_m} \tag{4}$$

where

$$W^{t-p}_{G_j} = \frac{S^0_{G_j} P^{t-p}_{G_j}}{P^{t-p}} \tag{5}$$

$$\pi^t_{G_j} = \frac{P^t_{G_j} P^{t-p}_{G_j}}{P^{t-p}_{G_1}} \tag{6}$$

Finally, the relative contributions of various commodity groups to the overall inflation rate are obtained by dividing both sides of Equation (4) by the overall inflation rate to yield, as follows in Equation (7):

$$\frac{W^{t-p}_{G_1} \pi^t_{G_1}}{\pi^t} + \ldots . + \frac{W^{t-p}_{G_m} \pi^t_{G_m}}{\pi^t} \tag{7}$$

This Equation illustrates that the contribution of each commodity group to the overall inflation rate comprises two components: the inflation rate of the commodity group and its share in the overall inflation rate.

2. Empirical Approach

For the decomposition analysis, the total household expenditure is divided into six categories:

i. Food (including beverages and tobacco)
ii. Clothing and Footwear (including all other textile and leather-based products like quilts, pillows, sheets, carpets, rugs, tapestries, towels, handbags, wallets, belts, etc.)
iii. Fuel and Lighting (including cock, coal and firewood)
iv. Housing and Furnishing (including imputed house rent, house maintenance expenses, household fixtures and furniture)
v. Transport and Communications
vi. Miscellaneous Non-Food (all other non-food expenditures)

An interesting question that the study attempts to answer is whether the contribution of food inflation to the overall inflation rate is consistent across the periods of high and low inflation rates. This question is motivated by the observation that Pakistan experienced the highest inflation rates during the years 2008, 2011, 2019-20 and 2022-24, when inflation was triggered by rising oil and commodity prices in global markets. Since the price elasticities of demand for food items are less than the elasticities of demand for non-food items,[4] the sellers of food products have a greater ability to shift the burden of an increase in the cost of production to consumers. As a result, the contribution of food inflation to the overall inflation rate is expected to be higher during periods of higher inflation rates associated with cost-push factors.

To address the above research question, we categorise the entire dataset into two categories, representing episodes of high and low inflation rates. This classification is done using three alternative benchmarks. The first benchmark is the sample average of inflation rates, which classifies inflation rates into relatively high and low inflation categories. The second benchmark is the 10 per cent inflation rate, because the double-digit inflation rate in Pakistan is often referred to as a critical rate that governments strive to avoid. The third benchmark is a 20 per cent inflation rate that Pakistan observed in only those periods when oil and commodity prices increased worldwide due to extraordinary situations, such as the Gulf War and the Ukraine-Russia War. Thus, we set up and test the following three directional hypotheses.

Hypothesis 1: The contribution of food inflation to the overall inflation rate is systematically higher during the periods when the inflation rate is above its mean value, as compared to the periods when the inflation rate is below the mean value.

[4] A recent study by Sher (2023) shows that income and price elasticities of food items are consistently lower than the corresponding elasticities of non-food items across the eight regions of Pakistan, comprising rural and urban areas of the four provinces. Similar results are found for the rural and urban regions of Pakistan in Sher and Ahmad (2021).

Hypothesis 2: The contribution of food inflation to the overall inflation rate is systematically higher during the periods of double-digit inflation rates as compared to the periods of single-digit inflation rates.

Hypothesis 3: The contribution of food inflation to the overall inflation rate is systematically higher during the periods when the inflation rate is 20 per cent or above (2008, 2011, 2019-20 and 2022-2024) as compared to the periods when the inflation rate is less than 20 per cent.

The decisions on these hypotheses are made based on the t-test for the difference in means of two samples.

It is often claimed that low-income households suffer the most due to inflation. The main argument is that if inflation results from the rising production costs, firms attempt to shift the burden to consumers. Since the price elasticities of demand for food and other basic necessities are lower, their producers have a greater ability to raise prices. Since low-income households spend a greater percentage of their income on such goods, they are more severely affected by inflation. However, a commonly used argument is that even if inflation reduces the purchasing power of nominal income in equal proportion for all households, the increased economic burden is felt more heavily by the low-income households because they have limited capacity to adjust their budgets to cope with inflation. Another argument is that since low-income households spend a greater percentage of their incomes on food and other basic necessities of life, they face a greater risk of food insecurity and failure to meet basic needs due to inflation.

To formally test the above proposition, we divided households into five income groups, separated by the four quintiles of per-adult equivalent income, and estimated household budget shares for each income group. Following the adult equivalence scales proposed by OECD (2011), a weight equal to one is assigned to the first adult household member, 0.7 to each additional member aged 14 years or above and 0.5 to each member aged less than 14 years. These budget shares are used in Equations (4) and (7) to re-estimate the inflation rate for each income group, assuming that the inflation rate for each commodity group is the same across all income groups. This assumption can be criticised because the consumption basket within a commodity group may also vary across income groups. The extent of bias caused by this assumption depends on the potential level of disaggregation. If all commodity groups contain just one item, there will be no bias on account of aggregation, except for the reason that all income groups may not have equal access to all markets. However, we hope that the qualitative nature of our results will remain valid despite this limitation.

In any case, once the overall inflation rates for the five income groups are estimated, we can analyse the differences in inflation rates across the income groups. In this respect, we test the following directional hypothesis.

Hypothesis 4: The Average inflation rate faced by any given income group is higher than the average inflation rate faced by the higher income group.

The decision on each component of this hypothesis is based on a t-test for the difference in means of two paired samples.

3. Data

The study relies on monthly data on the overall and group-wise commodity CPIs over the period from January 1997 to January 2024. The data are gathered from the websites of the State Bank of Pakistan and the Federal Bureau of Statistics. All the CPI data are converted to the common base year 2015-16 using the splicing method.

For the estimation of expenditure shares, we use household survey data from the Household Integrated Economic Survey (HIES) for 2015-16 (the base year), conducted by the Federal Bureau of Statistics. The survey year 2015-16 is chosen specifically because the year has to coincide with the base year in the calculation of CPI and other related statistics, as shown in Equations (1) to (7). The data on households' expenditures are converted to expenditure shares of the six commodity groups mentioned in Section II. For the aggregate analysis, the sample averages of the expenditure shares are computed to assign weights in Equations (4) and (7). For the income group-wise analysis, the expenditure shares of households are arranged in ascending order of per adult equivalent total expenditures. The average expenditure shares in the five income groups, separated by the four quintiles, are then computed. These shares are then used to compute the weights in Equations (4) and (7) for each income group.

III. Results and Discussion

To begin with, we discuss the general trend in the overall CPI inflation rate over the past 26 years. Figure 1 presents the overall trend in the year-to-year inflation rate over the study period. The figure shows wide variations in the inflation rate, ranging from about 1.3 per cent in September 2015 to 39.4 per cent in June 2023. The inflation rate moves along time in swings showing the impact of sticky expectations. The highest in-

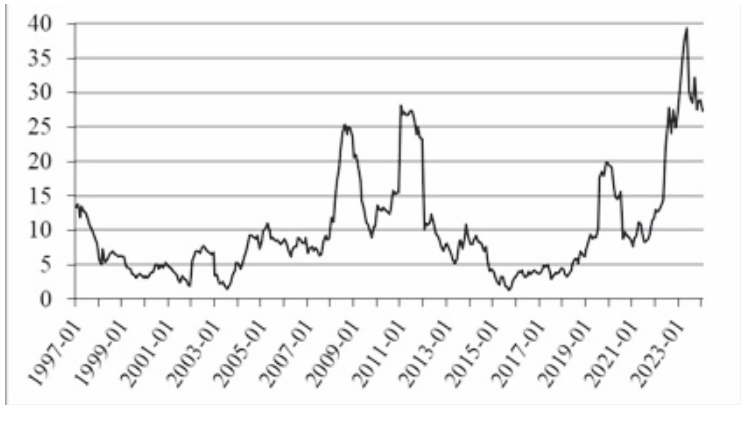

FIGURE 1

Trend in General Inlfation Rate

flation rates are observed in the years 2008, 2011, 2020 and 2022 onwards when the inflation rate exceeded 20 per cent. Apart from these years, the highest inflation rate in the given period was close to 14 per cent in 1997. All these instances of high inflation rates correspond to external shocks in the form of an extraordinary increase in oil and commodity prices on the world market. The most recent experience of inflation, from 2022 to 2024, originated from the oil price hike. However, it was also fueled by economic and financial mismanagement that resulted in currency crises, a rising cost of debt, and a lack of capital inflows, including private and institutional inflows.

As discussed in Section II, we have split the overall inflation rate into six components consisting of the six commodity groups. To what extent the overall inflation rate is tracked by the inflation rates of the specific commodity groups can be observed from scatter graphs with the overall inflation rate on one axis and the inflation rate of the particular commodity group on the other. These graphs are shown in Figures 2 to 7.

Figure 2 shows that the general inflation rate and the inflation rate of the food category almost follow a linear and close relationship. This is not surprising, as we will see later, because the food inflation rate is the largest component of the overall inflation rate. The close association between high food inflation and high overall inflation during the years 2008 and 2011 was directly linked to rising prices of all types of grains alongside the rising crude oil prices.

The most recent wave of cost-push inflation, exceeding the 25 per cent mark, triggered by an oil price hike following the Ukraine-Russia conflict, resulted in a phenomenal increase in the prices of grains. Food items, especially grains, sugar, cooking oils, tea and vegetables, are basic necessities of life with low price elasticities. Therefore, the sellers of these items could easily shift the burden of rising costs of production and transportation to consumers. Thus, food inflation and overall inflation moved closer to each other.

Another notable observation is that the food inflation rate exceeded the overall inflation rate when the latter was high, particularly when it reached double digits. For example, when the overall inflation rate was less than five per cent, the food inflation rate remained close to zero. However, when the overall inflation rate was between

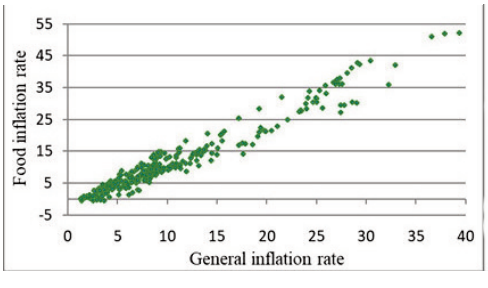

FIGURE 2

General and Food Inlfation Rates

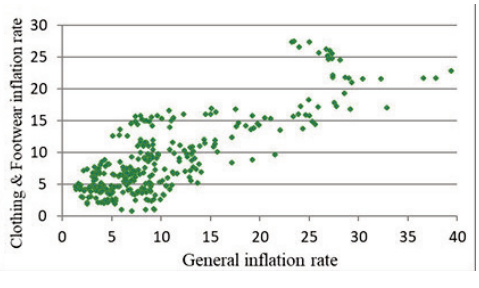

FIGURE 3

General and Cloting & Footware Inlfation Rates

25 and 40 per cent, the food inflation rate varied in the range of 30 to 52 per cent, with only a few exceptions. An obvious implication of this observation is that low-income households whose consumption basket has a dominant share of food would face a greater impact of high inflation.

The other components of inflation do not form such a strong relationship with the overall inflation rate. Figure 3 shows that although the inflation rate of clothing and footwear is positively related to the overall inflation rate, the relationship is not as strong as in Figure 2. Although most items in this category are necessities, their consumption can be postponed when prices increase. This explains why, unlike food inflation, the inflation rate of the clothing and footwear category has, on average, remained less than the overall inflation rate. For example, the figure shows an almost flat trend in the range of overall inflation rate, ranging from 15 to 25 per cent, where the inflation rate of clothing and footwear remained less than or around 15 per cent.

The relationship between fuel and lighting inflation rates and the overall inflation rate, as shown in Figure 4, is even weaker. Furthermore, on average, the inflation rate of fuel and lighting has been greater than the overall inflation rate when the latter was on the lower side, but the opposite has been the case when the latter was on the higher side. A plausible reason is that under the administrative price-setting regime, the price regulatory authorities for electricity, gas, and petroleum products tend to follow a staggered pricing practice to smooth out the impact of price variations on consumers.

Figure 5 indicates that the inflation rate of housing and furnishing moved closely with the overall inflation rate when the latter was in the single digits. However, at the higher rate of overall inflation (in double digits), the relationship gets quite weak and erratic despite the observation that the expenditure share of housing and furnishing is quite high. A plausible reason is that property prices, rents and costs of maintenance in Pakistan vary in cycles of booms and busts, somewhat independent of the overall inflationary trends. This market is driven mostly by speculation, exchange rate variations, remittance inflows, and government policies on housing projects, among other factors. For example, after the 9/11 event, when Pakistan received large volumes of remittances and many attractive housing schemes were launched, property prices and

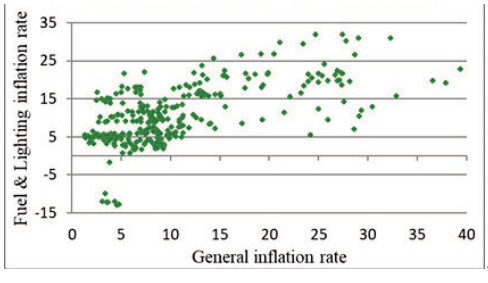

FIGURE 4

General and Fuel & Lighting Inlfation Rates

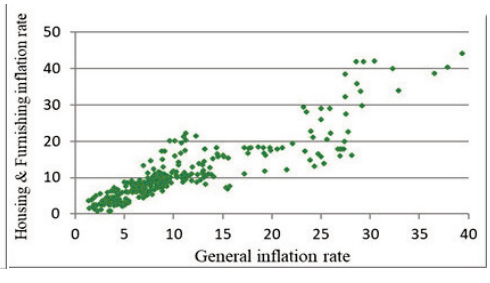

FIGURE 5

General and Housing & Furnishing Inlfation Rates

rents were observed to rise sharply despite the overall inflation rate being on the lower side. On the other hand, when the inflation rate is too high due to cost-push factors, housing prices and rents do not necessarily rise due to stagflation.

Figure 6 depicts a weak association of the inflation rate of transportation and communication with the overall inflation rate. For example, when the overall inflation rate is on the lower side, that is, less than 10 per cent, the inflation rate of transportation and communication varies between -5 per cent and a little more than 20 per cent, thus forming a weak relationship. The relationship, however, gets stronger at higher rates of inflation. Also noticeable is the similarity between Figure 4 and Figure 6 because of the connection between fuel prices and transport costs that account for a major portion of the price index of transportation and communication.

Finally, Figure 7 shows the association between general and miscellaneous non-food inflation rates. The non-food category includes all services other than transportation and communication, such as banking and finance, education, and health. It also includes entertainment, books and stationery, medicines, cosmetics and other personal care items. The inflation rate of the miscellaneous category has remained systematically lower than the overall inflation rate and the relationship between the two has been quite weak. A possible reason is that this category mostly includes items which are not the basic necessities of life. As a result, when the cost of production rises as a direct result of rising input prices or as a consequence of general inflation, it is difficult to shift the burden to consumers, and the inflation rate of this broad category remains low.

We now discuss the contributions of inflation rates of the six commodity groups to the overall inflation rate. These contributions are estimated using Equations (4), (5) and (6). The summary statistics of these contributions are presented in Table A-1 of the appendix, while the detailed results are illustrated graphically. However, to avoid congestion in the display due to high frequency and seasonal variations, the data series are converted to 12-month centered moving averages. The results are shown in Figure 8 as a stacked line chart in which at each month the contributions of the six categories of goods are accumulated vertically to yield the total equal to 100 per cent.

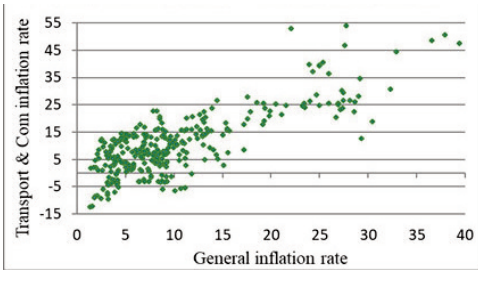

FIGURE 6

General and Transport & Com Inlfation Rates

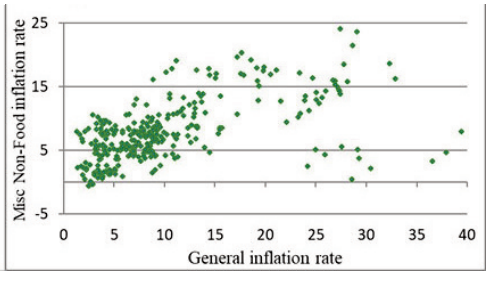

FIGURE 7

General and Misc Non-Food Inlfation Rates

We observe that the food inflation rate has by far the highest contribution to the overall inflation rate. It is further observed that the contribution of food inflation to the overall inflation rate was even greater during the periods when the latter was higher, particularly in the years 2008, 2011, 2020 and 2022 onwards. On the other hand, when the overall inflation rate was low, for example, in the early 2000s and the years 2017 and 2018, the contribution of food to the overall inflation rate was much smaller.

The contributions of the other five categories to the overall inflation rate are not much individually. Although the miscellaneous non-food and housing and furnishing categories have reasonably large budget shares, their contributions to the overall inflation rate are relatively small because of the lower respective inflation rates.

To further analyse the role of food inflation during periods of high and low inflation rates, we classify the data into two categories, representing high and low inflation rates, using three alternative criteria as explained in Section 3. Table 1 shows that the contribution of food inflation to the overall inflation rate during the episodes of higher inflation rate has been above 50 per cent under each of the three classifications of data. For example, the first two rows after the headings row show that when inflation rate was above the sample average, the contribution of food inflation was 51.4 per cent, compared to 38.4 per cent when the inflation rate was below the sample average. The next four rows of the table also show the same pattern.

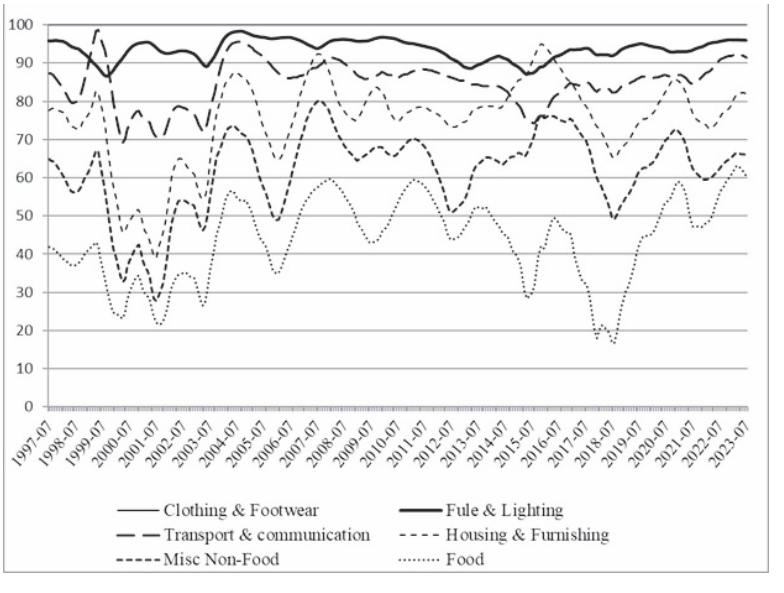

FIGURE 8

Cumulatie % Contributions of Sub-Categories
to 12-Month MA General Inflation Rates

The table also presents results of the three hypotheses testing as mentioned in Section III. The t-statistics for the difference in means are highly significant in each of the three classifications. Thus, we conclude that the contribution of food inflation to the overall inflation rate is significantly higher during the periods of high inflation rates as compared to its contribution during the periods of lower inflation rates.

The above results highlight the importance of exploring whether different income classes in Pakistan face the same or different inflation rates, given that their consumption baskets are diverse, especially considering the share of food expenditure. Thus, as explained in section 3, we divide the household budget data for the base year 2015-16 into five income groups separated by the four quintiles of per adult equivalent income and estimate the budget shares of the six commodity groups for each income group. We then use these budget shares to re-estimate the overall inflation rate for the five income groups. Since the budget share of food in particular is higher in the lower-income groups, the food inflation rate gets a greater weight in the estimation of the overall inflation rate for the low-income groups.

TABLE 1

Contributions of Food Inflation During High and Low Inflation Periods

Category	Number of observations	Overall inflation rate	Mean percentage contribution of food inflation	t statistic for the difference between means
Above average inflation rates	105	19.93	51.37	
				33.46*
Below average inflation rates	220	6	38.44	
Double digit inflation rates	107	18.77	51.23	
				33.37*
Single digit inflation rates	218	5.97	38.39	
Highest inflation rates 2008, 2011, 2019-20, 2022	41	27.05	57.17	
				37.78*
Moderate inflation rates	284	7.75	40.51	

Source: Authors' calculations and estimation
Note: * indicate significant t-statistics at the 1 per cent level

To what extent the estimates of inflation rate for the five income groups differ from one another can be tested by applying the t-test on the difference in mean inflation rates applied on each pair of income groups. The results, not presented here, indicate that the differences are statistically insignificant. However, if we consider the periods of double-digit inflation rates, the differences turn out to be significant. The results of this exercise are presented in Table 2.

The value outside the brackets in each cell is the estimated difference in the mean inflation rate for the income group shown in the corresponding row from the mean inflation rate for the income shown in the corresponding column. The value inside the brackets shows the respective t-value for the difference in the mean inflation rates. For example, the first cell shows that the mean inflation rate faced by the first income group has been 0.04 percentage points higher than the mean inflation rate faced by the second income group and the t statistic for this difference is 2.59.

The table indicates a consistent pattern that the mean inflation rate for each of the first to fourth income groups is systematically higher than that for the respective higher income groups. Although these differences are small in magnitude, they are all statistically significant. This result can be explained as follows. As noted in the discussion on Figure 1, the incidents of high inflation rates in Pakistan mostly coincide with the periods of external oil and commodity price shocks. The burden of the resulting increase in the cost of production falls with greater intensity on the prices of essential consumer goods that have low elasticity of demand. It follows that since poor households spend a greater percentage of their incomes on essential goods, they end up facing higher inflation rates.

This is an alarming result indicating that low-income groups pay a higher cost of inflation on two accounts. First, the low-income households face more difficulty in

TABLE 2

Differences in Mean Inflation Rates Across Per Adult Equivalent Income Groups During Double-Digit Inflation Episodes

	Income Group 2	Income Group 3	Income Group 4	Income Group 5
Income Group 1	0.04 (2.59*)			
Income Group 2	0.13 (3.68**)	0.24 (4.11**)		
Income Group 3	0.53 (4.67**)	0.09 (4.49**)	0.2 (4.63**)	
Income Group 4	0.48 (4.97**)	0.11 (4.73**)	0.4 (5.08**)	0.29 (5.21**)

Source: Authors' estimation
Note: * and ** indicate significant t-statistics at 5 and 1 per cent levels respectively.

coping with inflation, even when the rate of inflation is the same for all income groups. Secondly, during periods of high inflation rates, the inflation rate for low-income households is even higher.

IV. Concluding Remarks

This study analyses the structure of inflation in Pakistan, focusing on its composition and magnitude faced by different income groups. The study measures the contributions of inflation rate in six sub-categories of the consumption basket to the overall inflation rate, focusing particularly on food inflation in general and during the periods of high and low inflation rates. It further explores the extent to which the inflation rates faced by different income groups differ from one another. The empirical analysis relies on the tools of descriptive and inferential statistics, employing monthly data for the period January 1997 to January 2024.

It is found that food inflation is the major component of the overall inflation rate, and the two inflation rates have, therefore, followed a close historical relationship. On the other hand, inflation rates of clothing and footwear, fuel and lighting, housing and furnishing, transport and communications, and other miscellaneous non-food items do not form such a close association with the overall inflation rate. Further analysis shows that the contribution of food inflation to the overall inflation rate during the periods of high inflation rates has been significantly greater than the contribution during the periods of lower inflation rates. Since the share of food expenditure in the overall consumption basket is higher among the low-income households, it can be inferred that low-income households suffer more during periods of high inflation rates.

The distributional aspect of inflation is formally analysed by dividing the sample into five income groups separated by the four quintiles of per adult equivalent income and estimating the inflation rate for the five income groups using their respective budget shares as weights. The results show that for the overall sample, the differences between inflation rates across income groups are insignificant. It follows that inflation in Pakistan, unless accompanied by proportional increase in nominal incomes, has the effect of proportional tax rather than progressive tax.

However, further analysis shows that during the periods of high (double-digit) inflation rate, which mostly coincides with external cost push factors, the average inflation rates faced by lower income groups have been significantly higher than those faced by the respective higher income groups. In other words, during the periods of high inflation rates, the incidence of inflation is similar to regressive income tax. Thus, even if nominal incomes of all the income groups rise in the same proportion, equal to the overall inflation rate, the real income of low-income households will decline, whereas the real income of high-income households will rise, thereby making inflation in Pakistan analogous to regressive income tax. This amounts to poor households subsidising rich households.

This result has substantial policy relevance. Although the cost-push inflation can be partially controlled through demand management policies that target a reduction in aggregate expenditure, it remains relatively ineffective in controlling the prices of essential food items that have low income (aggregate expenditure) elasticity of demand. In follows that demand management policies are not sufficient to control inflation for poor households who spend a greater percentage of income on food. Thus, there is a need to improve administrative measures to ensure the regular supply of essential food items, such as wheat flour, rice, sugar, and edible oils, in order to stabilise their prices.

One such measure, though not directly analysed in this study, is to make the Competition Authority of Pakistan stronger and more effective. The authority may use its power and autonomy for taking legal necessary action against hording, a non-competitive practice. Similarly, there is a need to take more effective measures against the smuggling of grains, sugar and other such basic food items to the neighbouring countries. Effective implementation of such measures can contribute to reducing food inflation and its detrimental effect of poor households.

Agricultural pricing regulatory authorities have to make their pricing policies more transparent and credible to ensure fair and stable prices of important food items and industrial raw material, which in turn would result in smooth production decisions and regular supply, thereby controlling inflation.

The FBR (Federal Bureau of Revenue) has recently imposed GST (General Sales Tax) on certain food items like packed milk and milk products, which are now commonly consumed by low-income urban households and rural households working in nearby cities. There is a need to reconsider the GST structure based on an updated formal analysis of household data, especially focusing on the consumption pattern of poor households.

The findings of this study are subject to certain limitations. First, the analysis is conducted at aggregate level for the entire Pakistan, while the inflation rate may vary across different regions of the country. Likewise, the assumption of a uniform inflation rate for each commodity group across all income groups is unrealistic because the consumption basket within a commodity group can also vary across income groups. Although the qualitative nature of our results is not expected to depend on these assumptions, a more in-depth study for different regions of Pakistan and with further disaggregation of commodity groups would certainly provide more useful information to policy makers both at the federal and provincial levels.

To analyse the differential impact of inflation on different income groups the study focuses on food inflation. However, analysing the factors contributing to the inflation of non-food items could provide a more comprehensive understanding of the inflationary environment. Such an analysis that requires the application of additional statistical tools and extensive data can be taken up in a future study.

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APPENDIX

TABLE A1

Commodity Group-Wise Expenditure Shares and Inflation Rates

	Food	Clothing and Footwear	Fuel and Light	Housing and Furnishing	Transport and Comm	Misc Non-Food
Percentage expenditure Share	46.98	6.54	7.48	13.5	8.36	17.13
Inflation rates	11.02	8.82	10.57	10.27	10.03	8.32
Contribution to inflation rate	5.18	0.58	0.79	1.39	0.84	1.43
Percentage contribution to inflation rate	50.78	5.66	7.75	13.6	8.23	13.98

Source: Authors' estimation.