Working Paper 2024-1

NABARD

Policy Insights from the Dynamic Interplay Between Rural Demand and Rural Inflation in India

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May 2024

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Summary

Core inflation has conventionally been used as a convenient high-frequency indicator of demand conditions. In the context of the divided opinion in India on the state of rural demand in the post-COVID period, it may be useful to note that average rural core inflation has remained higher than average urban core inflation. Whether sluggish rural real demand is an outcome of higher inflation in the past or vice versa, i.e., whether higher rural core inflation is the result of stronger than expected momentum in rural demand is an empirical issue, that warrants deeper analysis to derive relevant policy insights. While annual growth in consumption expenditure as per the findings of the household consumption expenditure survey (CES) shows rural consumption demand performing better than urban consumption demand – in both nominal and real terms, growth in earnings as per the estimates obtained from the annual periodic labour force surveys (PLFS) shows no evidence of any major two-speed rural-urban divide. Multiple high frequency indicators of rural activity reveal no uniform sense on the current growth momentum in rural areas, but when they are combined into a single composite indicator, as in this paper, it shows sustained expansion, though at varied pace in recent months. Importantly, rural economic slack (measured from this monthly composite indicator) is found to dampen rural core inflation, implying that core inflation continues to serve its signalling properties as a relevant price-based indicator of demand conditions. Despite the complex nature of the dynamic interaction between demand and inflation in rural areas, some useful policy insights could be inferred from the empirical analysis presented in this paper: (a) bi-directional causality between rural food inflation and rural wages highlights the importance of supply management measures to avoid any unpleasant mix of high rural CPI inflation and weak rural demand, given that wages constitute a key source of rural income and that higher inflation erodes purchasing power, leading to stagnation/decline in real rural wages; (b) for real rural wages to rise, either productivity levels in existing jobs must increase or alternative more productive employment opportunities must expand, as relying on the option to increase nominal wages to compensate for higher inflation may only raise inflation further, not real demand; (c) while above trend growth in agricultural GVA can raise rural income, and hence rural demand, the favourable supply impact may dominate to dampen inflation, and as a result the usual demand and inflation relationship may not hold; and (d) core (non-food non-fuel) inflation remains a valid barometer of demand-induced inflation and, therefore, when multiple indicators of economic activity fail to provide much clarity on the true state of rural demand, warning signals from core inflation may help in calibrating demand management policies proactively for securing macroeconomic stability.

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Introduction

The state of demand conditions in an economy relative to supply capacity, inflation expectations and supply shocks are widely viewed as the prominent determinants of inflation in a country. Monetary policy, in turn – depending on its proactive avoidance of overheating of aggregate demand, sustained emphasis on anchoring inflation expectations, and careful accommodation of supply shocks – is viewed as the key force that shapes the evolution of the inflation trajectory in the medium-run. In the assessment of demand conditions, given the widely reported wedge between rural and urban demand conditions in the post-COVID period, an interesting research issue to examine is the sensitivity of rural inflation to rural demand conditions[1]. While rural inflation in India is impacted by common shocks that also determine the trajectories of headline CPI inflation and urban inflation, given the large size of the rural economy – in terms of its share in overall GDP and employment – it may be useful to assess how rural demand conditions influence rural inflation. One would presume that if rural demand has been weak on a sustained basis, as opined by some analysts, that would have also depressed rural inflation, in particular rural core (non-food non-fuel) inflation. Hard data, however, suggest that average rural and urban inflation have been largely similar; occasional deviations have closed over time; and importantly, average rural core inflation has exceeded average urban core inflation. Survey based data from the household consumption expenditure survey (July 2022-August 2023) and annual periodic labour force surveys (2017-18 to 2022-23) indicate that compound annual growth rate (CAGR) of average consumption expenditure has been higher in rural areas than in urban areas, because of which gaps in levels have narrowed, and the CAGR of earnings in rural areas is marginally lower than in urban areas. These demand related data (*i.e*., consumption expenditure and earnings that determine expenditure), in fact, support why average rural CPI inflation is so close to average urban CPI inflation, but a deeper analysis is warranted to understand the interplay between rural core inflation and rural demand for undertaking more effective supply side (including structural) and demand management policies.

Sectoral analysis, aimed at exploring the drivers of rural-urban differences in consumption, employment, earnings and inflation may often help in enriching overall macroeconomic assessment that guides the conduct of macroeconomic policies, given that data

[1] On the shape of the Phillips curve at the aggregate level, there have been several arguments in the literature on the flattening of the curve in the pre-COVID period (*i.e*., falling sensitivity of inflation to output gap or economic slack) and its steepening in the post-COVID period (Ari *et al*, 2023).

flows are lagged, subject to revisions, invariably reflect bottom-up aggregation, with possible asymmetric sectoral impact of common shocks, and the scope for sector specific idiosyncratic shocks having potential spillover effects on other sectors. Because of the large size of the rural economy in India, it often draws probing attention of analysts in their assessment of the state of the overall economy, notwithstanding data limitations, persisting animated debates on what is rural, and limited available research that could help understand reasonably well the changing dynamics and structural characteristics of the rural economy. Two specific issues which have been part of this curious search for greater clarity are: (a) what is the current state of rural demand, how it is changing over time and what are its key drivers; and (b) how sensitive is rural inflation to rural demand. This paper is an attempt to examine both these issues.

On the state of rural demand, it is important to first assess the significance of rural economy to economic growth and employment generation, and hence, to overall economic welfare. The next step is to use available high frequency information and construct a rural activity index that can work as a reasonable representative proxy of rural demand. On the relationship between rural demand and rural inflation – notwithstanding the importance of common shocks in driving inflation dynamics in the country and an integrated market post-goods and services tax (GST) regime, which together may explain a high degree of co-movement between rural and urban inflation – one would expect that slack in rural economic activity should also be disinflationary. Subdued/robust rural demand, thus, must have some explanatory power for explaining and forecasting rural inflation. Since both rural inflation and rural demand conditions can alter welfare levels in rural areas, tracking them and examining the interaction between them could be useful to policy making at the national as well as state level. Set against this context, Section II of the paper documents in brief insights from the available literature on the significance of rural economy to the overall economy in India. Section III discusses multiple high frequency indicators that could be combined using relevant statistical tools to generate a composite indicator of rural demand. The utility of the composite indicator in understanding rural inflation dynamics is studied in Section IV. Concluding observations are set out in Section V.

II. Significance of Rural Economy

Output, employment, and inflation are the three key macroeconomic variables that help assess overall economic welfare in an economy, because every individual expects her income level to rise; a stable job that can provide certainty to income flows; and a low inflation that

does not erode the purchasing power of income. As regards these three key macro parameters, the very fact that about 47 per cent of the country's net domestic product, more than 70 per cent of total employment, and 57 per cent of the all-India CPI basket is accounted for by the rural economy, it speaks volumes about the significance of rural economy to any assessment of overall economic welfare in the country. There has been an animated debate, however, on two broad sets of issues. The first relates to the definition of rural, and generation of macroeconomic data consistent with a more realistic definition of rural. The second one relates to tracking relevant high frequency indicators to be able to assess the changing pattern of rural economic activity, notwithstanding the scope for inconsistency and possible bias in one's analysis depending on the choice of indicators and the method of aggregation.

For generation of rural-urban statistics, the national statistical office (NSO)[2] adopts the census definition[3], which classifies urban areas into two categories: statutory towns – administrative units that have been notified (defined by statute) as towns or urban areas, and census towns – that satisfy the following three criteria simultaneously: (1) minimum population of 5,000 or more; (2) at least 75 per cent of the male working population engaged in non-agricultural activities; and (3) a density of population of at least 400 sq. Km. (*i.e.* 1000 per sq. Mile). Settlements that are not classified as urban are classified as rural.

There have been suggestions in recent years on the need for a relook at the approach adopted in India to classify rural-urban, so as to not only identify the true level of urbanisation in India but also to provide urban amenities in census towns that administratively remain rural (Shamika Ravi, 2023; NITI Aayog, 2021; Basu and Sharma, 2021; Debroy, Kapoor and Sinha, 2022; Kelkar and Pethe, 2024). The key arguments have been that classifying a census town into a statutory town is difficult in India because of affinity to reman rural, driven by the incentive of benefiting from government schemes for rural areas; a census town may be large enough in size but often remains deprived of the benefits of urban local governance structure unless notified as a statutory town – such as courts, hospitals, mass-transit, solid waste management and sanitation[4]; many census towns on the outskirts or around cities are peri-urban, and even within rural areas, there could be a further three-fold classification such as

[2] Concepts and Definitions Used in NSS, May 2001.

[3] Office of the Registrar General, India, in its Circular No.2, dated 04.09.2018 on Rural-Urban Classification for Census-2021 proposed to retain the same definition for urban areas to ensure comparability with previous census. This document provides detailed information on rural-urban classification.

[4] As per Census 2011, urban areas have 7933 settlements, of which 4041 are classified as statutory towns and the rest 3892 as census towns that continue to be governed as rural entities.

developed rural, emerging rural and under-developed rural; and, if one goes by only the population criteria, the level of urbanisation in India is much higher[5]. It has also been observed that states are reluctant to grant statutory status to census towns, recognising the accompanying requirement of higher funds for provision of urban infrastructure (Dev, 2023), and one state in fact had to reverse its decision of notifying a few census towns as statutory towns in 2020 due to resistance form residents of villages (Debroy, 2022). It has also been argued that urbanisation level in India at 32 per cent (as per 2011 census) is grossly underestimated – as against above 60 per cent levels of urbanisation reported in some studies for India in the past, including those based on night lights data – leading to considerable misallocation of resources involving various centrally sponsored schemes for rural areas (Kelkar and Pethe, 2024). At the other end of the debate, nevertheless, there have also been evidence-based arguments to suggest that there is no systematic underestimation of rural population (or rural bias) in Indian data (Kumar and Gopinath, 2023).

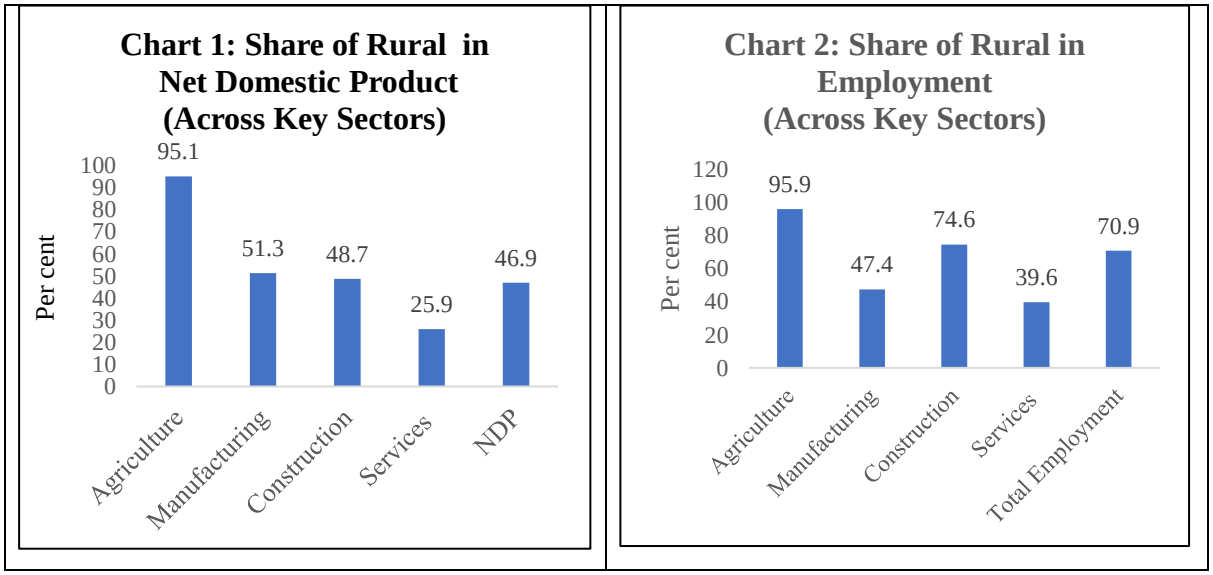
Unlike the census definition used by NSO, RBI uses a fourfold classification based on only one parameter, *i.e.*, population, as per the following[6]: (i) Rural: population less than 10,000; (ii) Semi-Urban: 10,000 and above and less than 1 lakh; (iii) Urban: 1 lakh and above and less than 10 lakh; and (iv) Metropolitan: 10 lakh and above.

Based on these above definitions, when available data are consolidated and assessed together, it helps understand the enormous significance of the rural economy to the performance of the overall economy. While national accounts data for the base period 2011-12 provide information on the share of rural in total net national product (NNP), the last quinquennial employment and unemployment survey of 2011-12 gives information on the share of rural in total workforce (for details please refer to Chand, 2022 and Chand, Srivastava and Singh, 2017). For the subsequent period, Annual Periodic Labour Force Surveys (PLFS) that started in 2017-18 provide information on employment status in rural areas, but real economic activity in rural areas is generally approximated by examining trends in different high frequency indicators. In 2011-12, the rural economy accounted for 46.9 per cent of total net national product and 70.9 per cent total workforce (Chart 1 and 2). Contrary to the perception that rural means agriculture, what is revealing from available data is that in

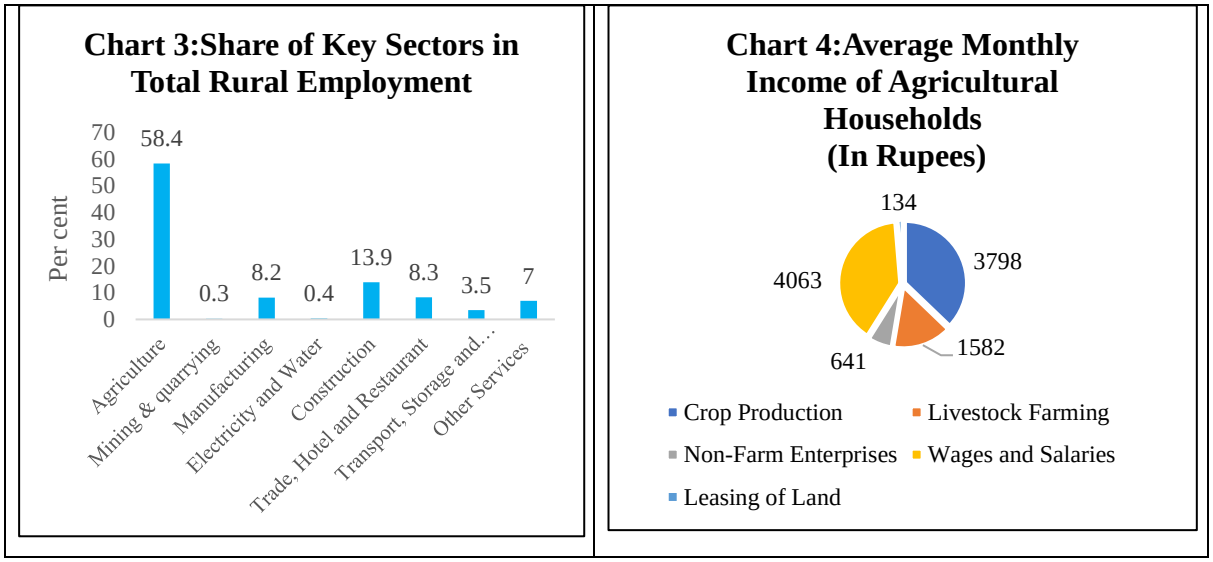
[5] 31 per cent urban share in population (as per 2011 census) rises to 46 per cent if more than 5000 population threshold is used, which rises further to 65 per cent population threshold of above 2,500.

[6] Guidelines for Identifying Census Centres, RBI,

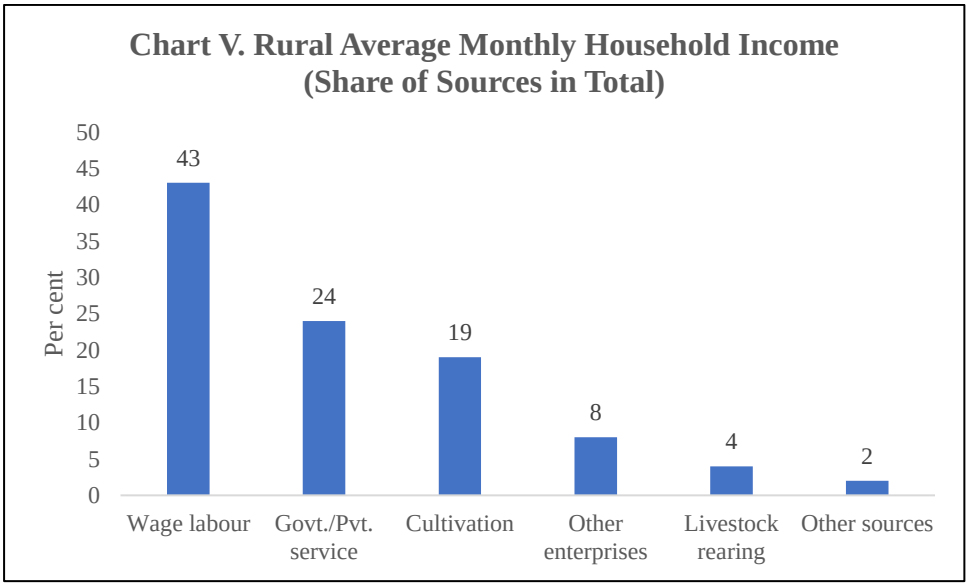
construction and manufacturing activities also the shares of rural are high, and that is why performance of agriculture alone may not help assess the state of the rural economy at any point in time. Based on estimates derived from PLFS data, the share of rural in total labour force was estimated to have increased from 70.7 per cent in 2019-20 to 73 per cent in 2020-21 (Chand, 2022). As per PLFS data for 2022-23, the distribution of rural workforce shows that while the share of agriculture continues to dominate, construction has emerged as the second most important non-farm source of employment (Chart 3). As per the NSO's 77th round of survey (Situation Assessment of Agricultural Households and Land and Livestock Holdings of Households in Rural India, January-December 2019), wages and salaries constitute the major source of income for agricultural households followed by crop income and livestock farming (Chart 4). According to the NABARD All India Rural Financial Inclusion Survey (NAFIS), 2016-17, the share of wage income in total income of rural households (that cover both agricultural and non-agricultural households) is even higher (Chart 5). Therefore, besides agriculture and allied activities, labour market conditions in rural areas, *i.e.,* growth in wages and salaries and employment pattern determine in a major way rural demand conditions.



Source: NSO and Chand *et al*. (2017).



Source: PLFS, 2022-23; NSO (SAS, 2019).

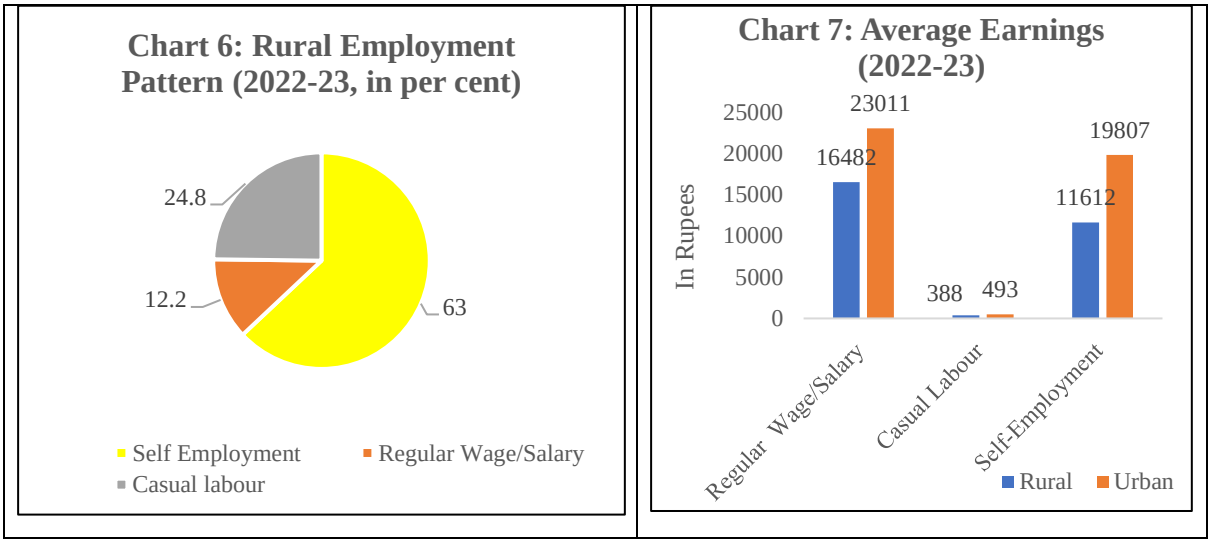


Source: NABARD (NAFIS, 2016-17)

Information available from 6 rounds of annual PLFS surveys (2017-18 to 2022-23) provide rich information on both growth in earnings and employment pattern in rural areas, urban areas and at the all-India level. The share of self-employment in total rural employment is high, followed by workers that get regular wages/salaries (Chart 6). Average earnings in rural areas (in level terms) are lower for all categories of employment (Chart 7)[7]. Earnings growth in rural areas, however, has been reasonably close to the trend in urban areas during 2017-18 to 2022-23 (Annex Table 1). For the self-employment category, which dominates the

[7] Earnings for casual labour is daily while for self-employment and regular wage/salary category it is monthly.

employment situation in rural areas, earnings growth seems to have been on par with urban areas, and even in the category of regular wage/salary earners, the gap is small.

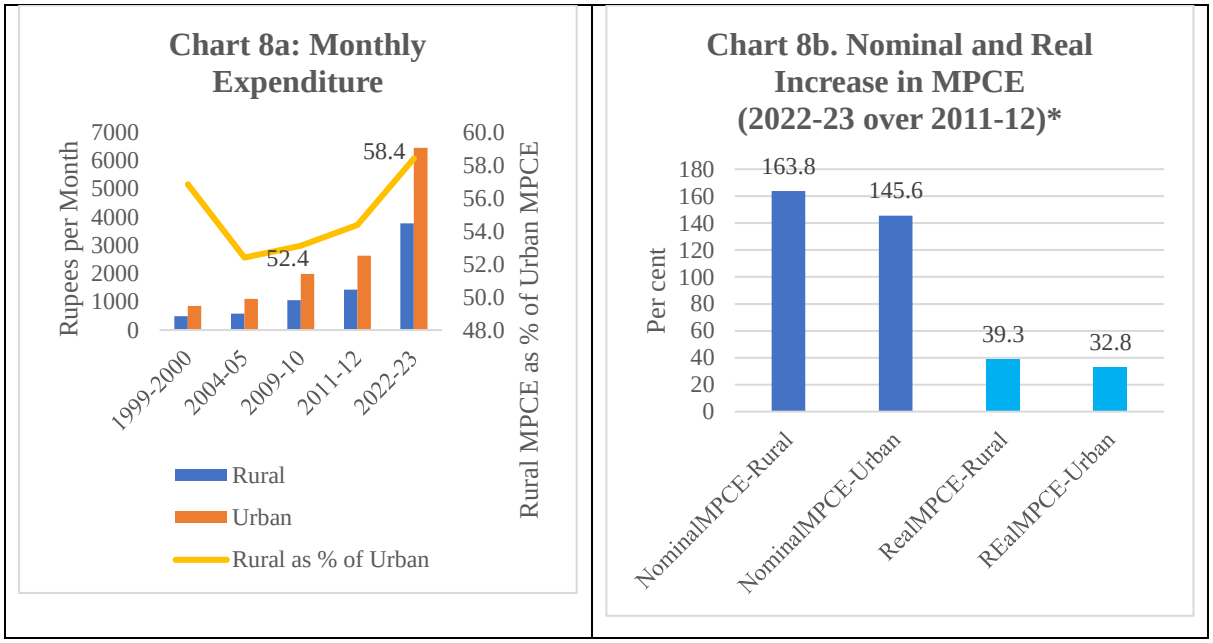


Source: PLFS, 2022-23

Household consumption expenditure survey data for 2022-23 (August 2022 – July 2023) provide another set of useful information to assess the performance of rural expenditure relative to urban expenditure, in terms of the magnitude of increase since 2011-12. While the level of urban monthly per-capita consumption expenditure (MPCE)[8] continues to be higher than rural-MPCE (Chart 8a), it is important to note that: (a) rural MPCE as percentage of urban MPCE has increased, pointing to gradual convergence, and (b) rural MPCE growth has been higher than urban MPCE, in both nominal and real terms (Chart 8b)[9].

[8] Excluding imputed values of Rs. 87 for rural and Rs. 62 for urban.

[9] It has been rightly argued that because of the scope for underestimation of levels (expenditure or income data collected through a survey), as in other countries, it may not be appropriate to compare survey based data on average consumption or earnings with per-capita consumption/earnings sourced from national accounts data such as per capita private final consumption expenditure (PFCE) or per capita gross national disposable income (GNDI) [Chandrasekhar and Ghosh(2024); Aiyar (2024)].



*Rural MPCE registered a compound annual growth rate (CAGR) of 9.2 per cent as against 8.5 per cent for urban MPCE; in real terms (deflated by respective CPI inflation) the corresponding CAGR were 3.2 per cent and 2.8 per cent, respectively.

Thus, the perceived two-speed recovery of rural and urban areas in the post-COVID period is not corroborated fully by the PLFS earnings data and per-capita monthly consumption expenditure data, in both nominal and real terms. Even employment trends suggest an increase in labour force participation rate, worker to population ratio and sustained decline in unemployment rate in rural areas during the same period (Table 1). Using data from Annual Survey of Industries, Nageswaran *et al.* (2024) also showed that wage growth for factory workers at 45 per cent in rural areas (between 2014-15 and 2021-22) was higher than 42 per cent recorded in urban areas, with a compound annual growth rate of 6.9 per cent in rural areas against 6.1 per cent in urban areas.

Real earnings (*i.e.*, when nominal earnings in rural and urban areas are deflated by respective rural and urban inflation), however, reveal that but for casual labour[10], real earnings in urban areas have performed only marginally better than in rural areas during the six-year period (2017-18 to 2022-23). The India Employment Report 2024 (ILO and IHD) also highlights structural factors (such as production processes becoming more capital intensive and labour saving) that may have depressed real wage growth (Chandrashekhar and Ghosh, 2024). Subdued rural demand has in fact been highlighted in recent years as a drag on growth (Dev, 2023) and

[10] In rural areas, self-employed, casual labourers and those getting regular wages/salaries account for 63 %, 12.2 % and 24.8 % of total employment, respectively.

the Economic Survey of 2022-23 also noted that growth in real rural wages was negative due to elevated inflation (GoI, 2023).

Table 1: Employment Trends

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Labour Force Participation Rate*						
Rural	50.7	51.5	55.5	57.4	57.5	60.8
Urban	47.6	47.5	49.3	49.1	49.7	50.4
All-India	49.8	50.2	53.5	54.9	55.2	57.9
Worker Population Ratio						
Rural	48.1	48.9	53.3	55.5	55.6	59.4
Urban	43.9	43.9	45.8	45.8	46.6	47.7
All-India	46.8	47.3	50.9	52.6	52.9	56.0
Unemployment Rate						
Rural	5.3	5.0	3.9	3.3	3.2	2.4
Urban	7.7	7.6	6.9	6.7	6.3	5.4
All-India	6.0	5.8	4.8	4.2	4.1	3.2

Source: PLFS. *: 15 years and above

After finding little evidence in support of the two-speed rural-urban growth hypothesis from survey-based data, in the next section another approach is adopted, *i.e*., by studying the high frequency monthly indicators of rural demand, both individually and also by constructing a composite indicator of rural demand. Wherever necessary, nominal values of high frequency indicators have been deflated to remove the impact of inflation, enabling an assessment of trends in real terms.

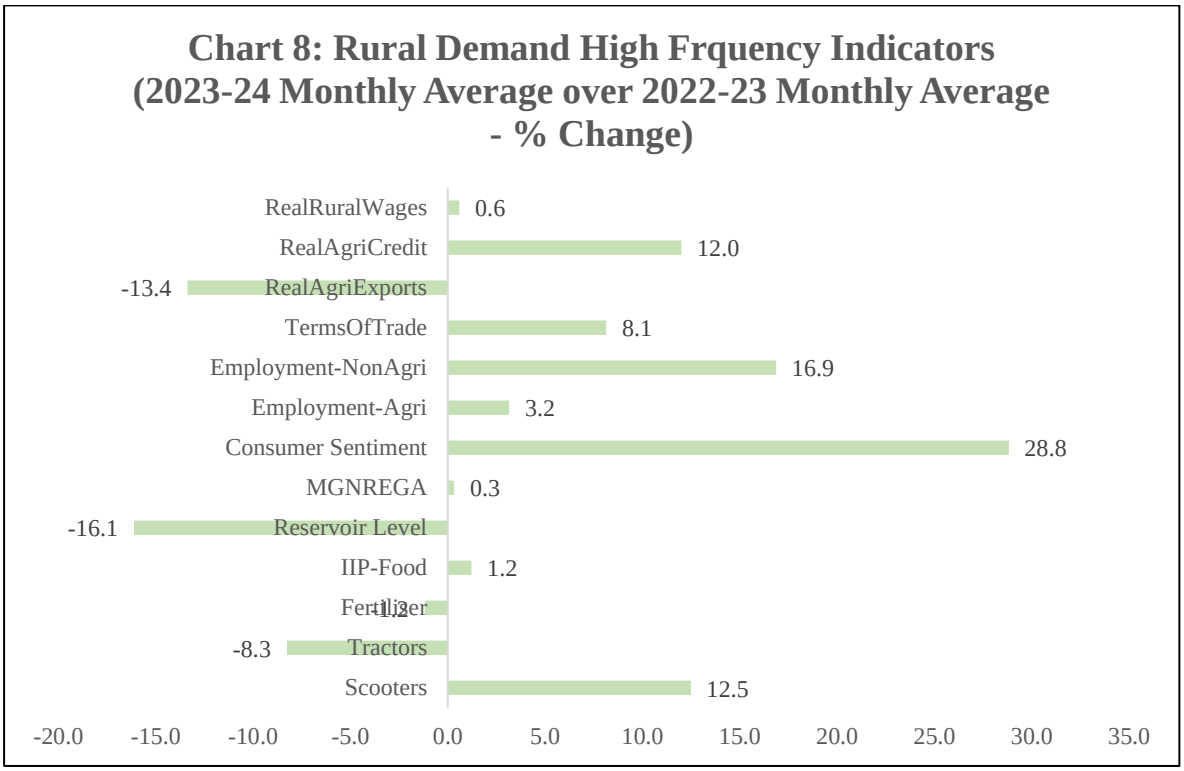
III. Composite Indicator of Rural Activity

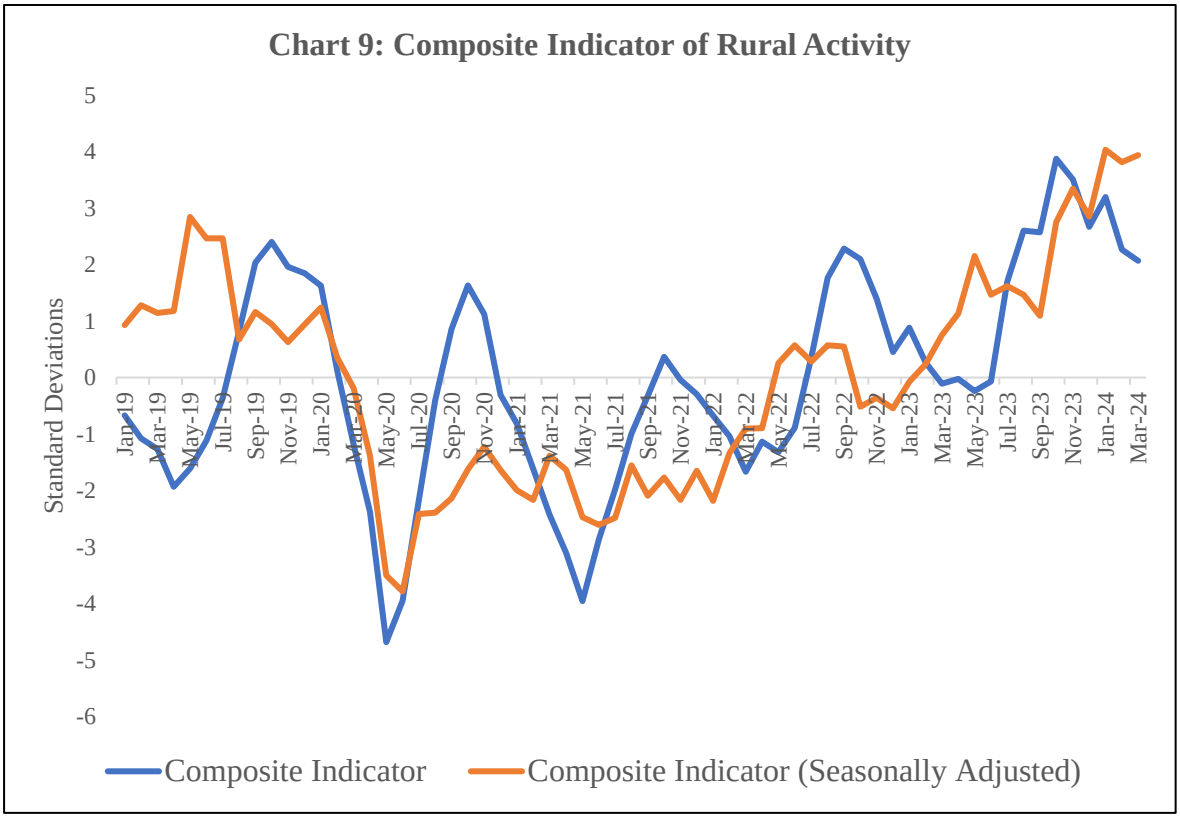
Tracking high frequency indicators of rural demand – each relevant for some segment of the rural economy but together enhancing their overall information content – has been a standard practice to monitor rural economy trends. Following this approach, thirteen high-frequency indicators are used, namely, rural real wages, real agricultural credit, real agricultural exports (all deflated by CPI-rural), terms of trade (*i.e.*, relative prices of food to non-food, sourced from the wholesale price index), rural employment in both agriculture and non-agriculture sector, rural consumer sentiment, MGNREGA demand, reservoir level, IIP-food, fertiliser sales, tractor sales, and two wheeler sales. When assessed individually, several indicators have registered positive and higher growth in 2023-24 compared with 2022-23 (Chart 8).

Since the high frequency indicators considered here are likely to be highly correlated, have different seasonal patterns, and also exhibit the impact of idiosyncratic (or indicator specific) shocks, the well-known dimension reduction technique – the principal component analysis (PCA) is employed, enabling construction of a composite indicator which is much easier to interpret than trying to find a common trend in separate indicators. PCA helps in transforming correlated original variables into a new set of uncorrelated (orthogonal) variables or principal components, as linear combinations of original variables, sorted in descending order based on amount of variance in the original set of data they capture. PCA suggests that four principal components capture about of 79 per cent of total variance, and the composite indicator is constructed[11] based on the eigenvalues and eigen vectors (reported at Annex 2). Since the underlying variables are heterogenous and not directly comparable, they are standardised first (each with zero mean and unit variance). The index values, accordingly, hover around zero (which reflects the average value of the index for the period January 2020 to March 2024), with positive/negative values indicating higher/lower values in terms of standard deviations above/below the average. Since the impact of COVID waves and seasonality in each of the underlying variables is difficult to disentangle, data are used in both original (*i.e.*, without any seasonal adjustment) and de-seasonalised forms for constructing the composite index separately. The index shows that rural demand weakened during COVID waves; it normally peaks every year in the immediate post-festival period of October and slackens before kharif sowing; and exhibited expansion during 2023-24 (Chart 9). For studying

[11] Using E Views 13

the explanatory power of the composite indicator in assessing rural inflation dynamics, monthly data over a longer period (January 2016 to December 2023) has been considered.





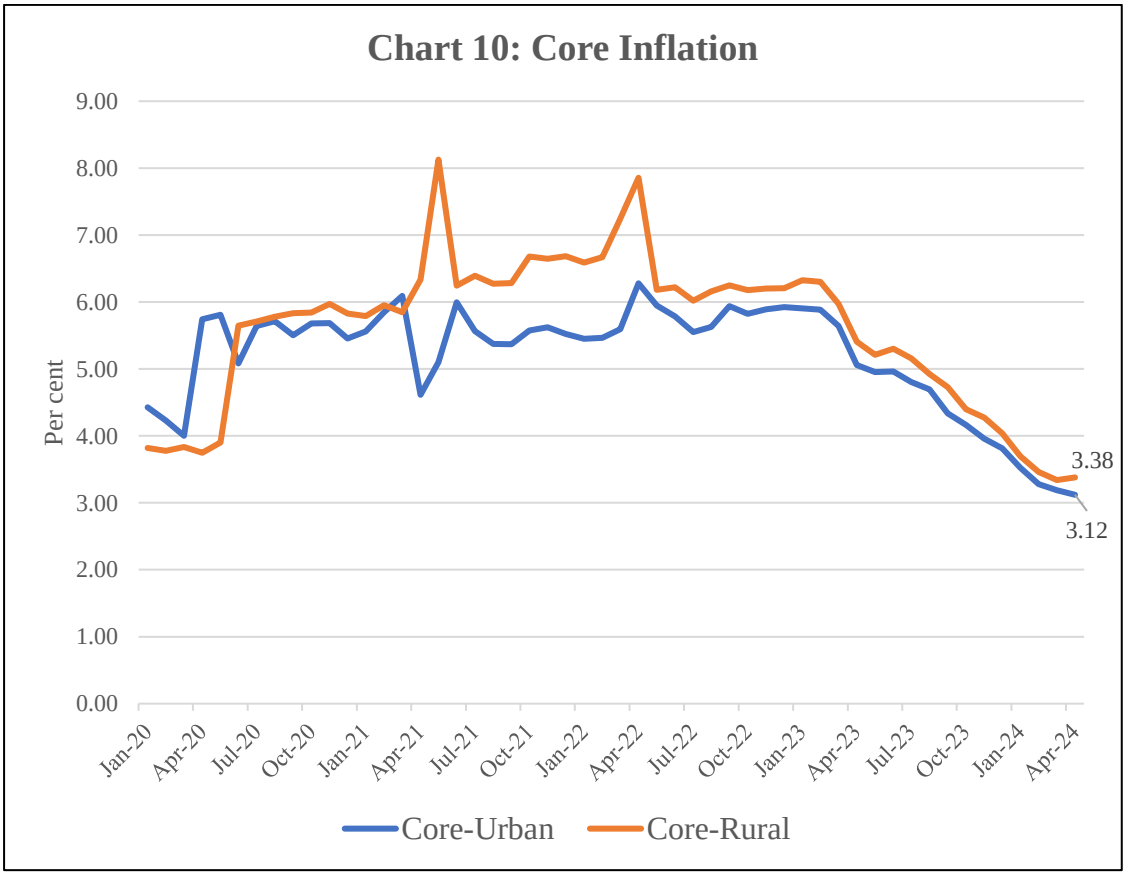
IV. Sensitivity of Rural Inflation to Rural Demand

Inflation (ex-food ex-fuel) has conventionally been viewed as a convenient barometer of excess demand[12] to guide the conduct of monetary policy, as persistent supply shocks, unless accommodated by monetary policy (by relaxing the credit constraint that helps consumers to smoothen demand) cannot keep core inflation elevated for long. A relative price (or supply) shock can have a contractionary demand effect on items in the CPI basket that are not directly impacted by the supply shock (thereby stabilising inflation automatically), but this outcome may materialise only when consumers are credit constrained. When monetary policy accommodates supply shocks, however, sustained access to credit at reasonable costs (relative to what may be required to tame inflation through monetary policy) helps in averting the contractionary demand effects of adverse supply shocks. Sensitivity of core inflation to economic slack has been a key channel that monetary policy aims to exploit, besides its focus on anchoring inflation expectations, to tame inflation. At the aggregate level, notwithstanding the persisting challenge of tracking the time varying slope of the Phillips curve (showing the magnitude of sensitivity of inflation to economic slack) and exogenous forces that shift the Phillips curve upward/downward, considerable amount of literature with constantly updated available estimates on the slope of the curve provide clarity on the relationship between demand and inflation at the aggregate level. The same could also be explored for rural demand and rural inflation. This may be particularly useful given that the average rural core inflation has exceeded urban core inflation in the post-COVID period, and also over the entire period for which CPI inflation data are available (Table 2 and Chart 10). George *et al* (2024), following the approach adopted by Dholakia and Kadiyala (2018) found that in the post-COVID period spillovers from non-core to core inflation has weakened the predictability property of core inflation, although in the long-run non-core inflation still converges to core inflation. Studying the rural-urban inflation dynamics covering data for the period January 2012 to October 2020, Bhoi *et al*., (2020) had also noted the lower average urban core inflation but concluded that both trend and cyclical components are similar for urban and rural CPI inflation; differentials between rural and urban CPI inflation are transient and they exhibit a long-run equilibrium relationship.

[12] Core inflation represents the underlying and persistent component of inflation, viewed generally as demand-induced or monetary inflation (Landau, 2000).

Table 2: Average Inflation (In per cent)

	Post-COVID Monthly Average Inflation (January 2020 to April 2024)	Monthly Average Inflation (January 2012 to April 2024)
CPI Inflation (Rural)	5.99	6.01
CPI Inflation (Urban)	5.90	5.74
CPI Food Inflation (Rural)	6.43	6.05
CPI Food Inflation (Urban)	6.78	6.23
CPI Core Inflation (Rural) (Weight:37.9)	5.59	6.0
CPI Core Inflation (Urban) (Weight: 58.1)	5.19	5.47



As per SAS and NAFIS (as mentioned above), wages constitute the dominant source of income followed by income from farm produce. Since rural nominal wages and rural inflation (and food inflation) exhibit bi-directional causality, higher rural inflation may raise rural nominal wages but such increases in nominal wages would not help in reversing the stagnation in real wages, which is a key driver of rural real demand (Annex Table 3).

To explore the relationship between rural demand and rural core inflation, a measure of slack is first constructed from the composite indicator of rural demand, *i.e.*, by taking the difference of the series from the mean value (as deviations from the mean value can help understand the momentum, given the way in which the composite indicator is constructed). As the next step, stationarity properties of the variables are checked to identify the suitable model for estimation. For the sample period starting from January 2016 (for which continuous monthly data on thirteen high frequency indicators of rural activity are available) up to December 2023, it is found that while the composite indicator gap (CIGAP) variable is I(0) rural core inflation is I(1). Accordingly, the auto-regressive distributed lag (ARDL) methodology is used for estimation (Annex Table 4). To estimate the dynamics over a longer period for which CPI rural inflation data are available (*i.e.*, since Q1:2012), seasonally adjusted quarterly data on agricultural real GVA and YoY increase in quarterly rural real wages are used to capture the impact of demand on rural inflation. Since all these variables are found to be I (0), OLS methodology is employed. Thus, for the model using monthly data, the sample period is January 2016 to December 2023, and for the quarterly model the sample period is from 2012: Q1 to 2023: Q4. All relevant data are sourced from the RBI Handbook of Statistics and CMIE database. To retain the focus of analysis on the relationship between demand and inflation, other plausible determinants of inflation are not explored, which otherwise may have raised the explanatory power of the models.

In the ARDL model, a trend is added to capture the impact of variables that might have altered the trend inflation over time. A dummy variable is also used to account for large exogenous shocks post-COVID and the war in Ukraine when rural core inflation hovered at or above 6 per cent (the upper tolerance band of the inflation target). Bounds test of cointegration (with an F value of 9.37 exceeding the critical value of 8.74 at 1 per cent level of significance) supports the presence of a co-integrating relationship. The long-run coefficient of CIGAP is found to be statistically significant with a positive sign, suggesting that core inflation remains a valid indicator of rural demand conditions (Table 3). The error correction term, which is correctly signed with a value of less than one, is statistically significant. But its low value (-0.28) indicates slow speed of adjustment, *i.e.*, any deviation from the long-run relationship between rural demand and rural core inflation may take time to close.

Table 3: Regression Coefficients: Long-run and Short Run

Rural Core Inflation	Long-run Coefficients	Short-Run Coefficients (Error Correction Equation)
CIGAP	**0.37** **(2.09)****	
Constant		2.19 (4.29)*
Trend		-0.008 (-3.34)*
Error Correction		**-0.28** **(-4.35)***
DUM1		0.45 (3.01)**

*, **, *** indicate significant at 1%, 5 % and 10 % level.

Note: Breusch-Godfrey Serial Correlation LM Test shows the absence of serial correlation (F statistics of 0.269665 with p value of 0.7646 fails to reject the null hypothesis that errors are uncorrelated) and the Breusch-Pagan-Godfrey test point to no heteroscedasticity problem in errors (F statistics of 1.340597 with p value of 0.2610 failing to reject the null hypothesis that errors are homoscedastic). The ARDL lag length being (1,0), *i.e.*, 1 for rural core inflation and zero for CIGAP (with a constant, trend, and DUM1 as fixed regressors), CIGAP is not there in the error correction equation. This would mean that CIGAP matters more in the medium-run as a determinant of core inflation.

For the longer sample period starting 2012: Q1, a measure of slack in rural demand is derived by first constructing the de-seasonalised agricultural GVA series and then using the HP filter to extract the gap (AGRIOGAP). The OLS regression that adjusts for first order autocorrelation shows that increase in rural real wages exerts an upward pressure on rural core inflation. A positive value of AGRIOGAP should also mean an increase in rural income and therefore rural demand. But a positive AGRIOGAP also means above trend supply (or production) of farm output and, therefore, it moderates inflation (lower food inflation resulting from a favourable supply shock may be dampening core inflation also by reducing the spillover risks from food prices to core inflation[13]).

Rural COREINFL = 6.38 + 0.06*REALRURALWAGE – 11.18*AGRIOGAP +0.96*AR(1)
(4.39)* (2.69)* (-1.74)*** (21.21)*

Adjusted R-squared: 0.8422; DW: 1.85

[13] The magnitude and duration of impact of food price shocks on CPI core inflation, as per estimates presented in Behera *et al* (2024), appears to have moderated over time. The response of core inflation to a one per cent rise in food inflation has declined from 37 basis points in 1998-99: Q2 to 14 basis points in 2023-24: Q3.

V. Conclusions

The empirical relationship between aggregate demand and inflation – which guides the conduct of demand management policies for securing macro stability – was disturbed in the post-COVID period following large and overlapping supply shocks. While the Indian economy exhibited remarkable resilience and has regained robust growth momentum, emerging as the fastest growing major economy in the world, opinions continue to highlight the weak state of rural demand as a concern. This paper finds that consumption expenditure data from the household consumption expenditure survey (2022-23) and earnings data from the annual periodic labour force surveys (PLFS) (2017-18 to 2022-23) do not support the hypothesis of a two-speed rural-urban growth pattern, and multiple high frequency indicators may exhibit different speed, but when combined in the form of a composite indicator they point to sustained expansion. Importantly, average rural core (non-food non-fuel) inflation has remained above urban core inflation in the post-COVID period, and also since January 2012 (the period for which monthly CPI inflation data are available). Higher rural core inflation (despite differences in CPI weights for rural and urban households and specific price dynamics of items covered under core basket) may have been difficult to sustain if rural demand was weaker than urban demand over a prolonged period.

Empirical assessment presented in this paper also shows that, using a monthly composite indicator of rural demand derived from thirteen high frequency indicators of rural economic activity, a measure of slack obtained from the constructed composite indicator influences rural core inflation. The positive coefficient of the slack variable is found to be statistically significant. Thus, rural core inflation remains a valid indicator of rural demand conditions. Recognising that rural wages and farm output are the two major sources of agricultural and rural income, their influence on rural core inflation is also examined separately. As expected, the relationship between real rural wage growth and rural core inflation is positive and statistically significant. In turn, above trend growth in agricultural GVA (seasonally adjusted) also raises rural income and demand, but higher than normal growth in farm output imparts a positive supply shock, that lowers inflation. The following insights from the findings of this paper could help in designing supply side (including structural) and demand management policies: (a) bi-directional causality between rural food inflation and rural wages highlights the importance of supply management measures to avoid a possible unpleasant mix of high rural CPI inflation and weak rural demand, given that wages constitute the key source of rural income and higher inflation erodes purchasing power, leading to stagnation/decline in

real rural wages; (b) for real rural wages to rise, either productivity levels in existing jobs must increase or alternative more productive employment opportunities must expand, as relying on the option to increase nominal wages to compensate for higher inflation may only raise inflation further, not real demand; (c) while above trend growth in agricultural GVA can raise rural income, and hence rural demand, the favourable supply impact may dominate to dampen inflation, and as a result the usual demand and inflation relationship may not hold (*i.e.*, monitoring the source of rural demand is important, as every driver of rural demand need not be inflationary); (d) core (non-food non-fuel) inflation remains a valid barometer of demand-induced inflation and, therefore, when multiple indicators of economic activity fail to provide much clarity on the true state of rural demand, warning signals from core inflation may help in calibrating demand management policies proactively for securing macro stability.

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Annex Table 1: PLFS Earnings (Nominal and Real)

Rural Nominal Earnings in Rupees						
(April-June)	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Average Wage/Salary Earnings (per month)	13207	12667	13423	14266	14766	16482
Average Earnings (per day) by Casual Labour	262	279	285	317	368	388
Average earnings from Sel Employment (per month)	8963	8743	8611	9232	10601	11612
Indexed to 2017-18=100 (Nominal)						
Average Wage/Salary Earnings (per month)	100.0	95.9	101.6	108.0	111.8	124.8
Average Earnings (per day) by Casual Labour	100.0	106.5	108.8	121.0	140.5	148.1
Average earnings from Sel Employment (per month)	100.0	97.5	96.1	103.0	118.3	129.6
CPI (Average): 2012=100						
Rural (April-June)	139.8	142.57	151.93	160.27	172.3	180.17
Urban (April-June)	135.47	141.4	150.77	159.3	170.47	178.5
2017-18 (April-June) =100						
Rural	100	101.98	108.68	114.64	123.25	128.88
Urban	100	104.38	111.29	117.59	125.84	131.76
Rural Real Earnings (2017-18=100)						
Average Wage/Salary Earnings (per month)	100.0	94.0	93.5	94.2	90.7	96.8
Average Earnings (per day) by Casual Labour	100.0	104.4	100.1	105.5	114.0	114.9
Average earnings from Sel Employment (per month)	100.0	95.7	88.4	89.8	96.0	100.5
Urban Nominal Earnings in Rupees						
Average Wage/Salary Earnings (per month)	17473	18657	20551	20062	21647	23011
Average Earnings (per day) by Casual Labour	316	352	370	394	464	493
Average earnings from Sel Employment (per month)	14878	16353	13405	14349	17725	19807
Indexed to 2017-18=100						
Average Wage/Salary Earnings (per month)	100	106.78	117.62	114.82	123.89	131.69
Average Earnings (per day) by Casual Labour	100	111.39	117.09	124.68	146.84	156.01
Average earnings from Sel Employment (per month)	100	109.91	90.10	96.44	119.14	133.13
Urban Real Earnings (2017-18=100)						
Average Wage/Salary Earnings (per month)	100.0	104.7	108.2	100.2	100.5	102.2
Average Earnings (per day) by Casual Labour	100.0	106.7	105.2	106.0	116.7	118.4
Average earnings from Sel Employment (per month)	100.0	105.3	81.0	82.0	94.7	101.0

Source: Annual PLFS, 2017-18 to 2022-23 and RBI

Annex 2

All 13 high frequency indicators are standardised (mean=0 and SD =1) first and then Kaiser's criterion (with eigenvalues greater than one) is used to choose the optimal number of principal components as four (Table 2a). Eigenvectors of the principal components showing the weight of each of the 13 variables in every principal component are presented in Table 2b.

Table 2a: Eigenvalues of the Principal Components

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	3.657293	1.345348	0.2813	3.657293	0.2813
2	2.311945	0.258604	0.1778	5.969237	0.4592
3	2.053340	0.758621	0.1579	8.022578	0.6171
4	1.294719	0.330771	0.0996	9.317296	0.7167
5	0.963948	0.107188	0.0741	10.28124	0.7909
6	0.856760	0.237820	0.0659	11.13800	0.8568
7	0.618939	0.264565	0.0476	11.75694	0.9044
8	0.354374	0.058539	0.0273	12.11132	0.9316
9	0.295835	0.079815	0.0228	12.40715	0.9544
10	0.216020	0.053653	0.0166	12.62317	0.9710
11	0.162367	0.01154	0.0125	12.78554	0.9835
12	0.150213	0.085965	0.0116	12.93575	0.9951
13	0.064248		0.0049	13.00000	1.0000

Table 2b: Eigenvectors of the Principal Components

Variables	PC1	PC2	PC3	PC4
SCS	0.274484	-0.429525	0.225893	0.073220
SEMPA	-0.032398	0.381579	-0.068454	-0.189712
SEMPN	0.341797	-0.298379	0.213769	0.222470
SFRT	0.313050	0.273224	-0.239560	-0.081086
SIIPF	0.078250	0.048501	0.558234	-0.285363
SMGNR	-0.384559	0.176638	-0.107781	0.319103
SRCRED	0.204664	0.290502	0.341195	0.233971
SRESV	0.376279	0.174233	-0.130422	-0.285053
SREXP	-0.093933	0.387533	0.485526	0.099465
SRRW	-0.347007	-0.347220	-0.072931	0.072825
SSCT	0.347483	-0.140531	-0.049225	0.324369
STOT	0.321921	0.052013	-0.350696	-0.122938
STRCT	0.132993	0.254438	-0.134421	0.669177

S - Standardised (for all variables); CS: Rural Consumer Sentiment; EMPA: Employment in Agriculture; EMPN: Employment in Non-Agriculture; FRT-Fertiliser; IIPF- IIP Food; MGNR – MGNREGA; RCRED – Real Credit; RESV – Reservoir Level; REXP -Rural Exports; RRW – Real Rural Wages, SCT -Scooters; ToT -Terms of Trade (WPI food/WPI Non-Food Manufactured Products); TRCT -Tractors.

Annex Table 3: Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Prob.
FOODINFL-R does not Granger Cause CPIINFL-R	1.25850	0.2873
CPIINFL-R does not Granger Cause FOODINFL-R	0.55702	0.5742
COREINFL-R does not Granger Cause CPIINFL-R	2.08008	0.1288
CPIINFL-R does not Granger Cause COREINFL-R	1.38747	0.2532
RURALWAGE-N does not Granger Cause CPIINFL-R	2.79125	0.0648
CPIINFL-R does not Granger Cause RURALWAGE-N	6.41977	0.0022
COREINFL-R does not Granger Cause FOODINFL-R	1.09966	0.3359
FOODINFL-R does not Granger Cause COREINFL-R	0.89246	0.4120
RURALWAGE-N does not Granger Cause FOODINFL-R	4.50071	0.0128
FOODINFL-R does not Granger Cause RURALWAGE-N	6.11682	0.0029
RURALWAGE-N does not Granger Cause COREINFL-R	1.03841	0.3568
COREINFL-R does not Granger Cause RURALWAGE-N	2.04231	0.1337

Note: FOODINFL-R stands for food inflation rural and RURALWAGE-N for YoY change in average rural wages (across job categories in the monthly Labour Bureau data) in nominal terms.

*, **, *** indicate significant at 1%, 5 % and 10 % level.

Annex Table 4: Stationarity Test Results

Variables	Augmented Dickey-Fuller (Level)	Phillips-Perron (Level)
2012:Q2 to 2023:Q4		
Rural COREINFL	-3.409291*	-3.373393*
AGRIOGAP	-3.000961**	-3.184383**
REALRURALWAGE	-3.119412*	-2.487873
2016:M1 to 2023:M12		
Rural COREINFL (First Difference)	-2.340075 -11.05368*	-2.258727 -11.22726*
CIGAP (First Difference)	-2.143263** -12.27187*	-1.707222** -15.80296*

*, **, *** indicate significant at 1%, 5 % and 10 % level. All equations have an intercept but for CIGAP which is estimated without an intercept.