



Engel's Law Revisited: A State-Level Analysis Of Food Expenditure Trends In Rural And Urban Households (2023–24)

Ms. Riddhima Panda¹, Dr. Ankita Rajgarhia², Dr. Debashish Mazumdar³

¹Assistant Professor in Economics, Department of Commerce, St. Xavier's College (Autonomous),
Kolkata - 700016, (W.B), India.

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¹Research Scholar, Research Centre in Natural and Applied Sciences, Raja Narendra Lal Khan Women's
College (A), Vidyasagar University, Midnapore 721102, (W.B), India

²Asst. Professor, Department of Economics, The Heritage College, Kolkata 700107, (W.B), India.

³Professor, Department of Economics, The Heritage College, Kolkata 700107, (W.B), India.

Abstract

According to Engel's law, although total food spending may increase, the percentage of household income spent on food decreases. Using data on household consumption expenditures, this study investigates the applicability of Engel's law in the Indian setting. The study examines the relationship between total spending and food consumption across various income levels using regression analysis on NSS survey data. The results support Engel's hypothesis by confirming that households with higher incomes spend less on food. Furthermore, structural changes in consuming behaviour are highlighted by differences in spending patterns between the rural and urban sectors. The study sheds light on the changing demand for food and how it affects market dynamics and economic policy. In this paper, we aim to investigate whether the same relationship holds for rural and urban India across Indian States in 2023-24. In fact, the recent Survey on Household Consumption Expenditure (2023-24) made it possible to look into this issue. Thus, this study is based on both time series and cross-section analysis for finding out the relationship between the changes in share of monthly consumption expenditure on food items and the changes in Monthly Per Capita Consumption Expenditure (MPCE) in rural and urban areas across the major Indian States over time. This analysis focuses on both rural and urban areas across 18 major Indian states, namely Andhra Pradesh, Gujarat, Haryana, Karnataka, Bihar, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Assam, Jharkhand, Chhattisgarh, Telangana and West Bengal, taking into account their diverse socio-economic and cultural contexts.

Keywords: Engel's Law, MPCE, Household Consumption Expenditure, Food Expenditure, Cross-section analysis

Introduction

Ernest Engel, a German statistician of the 19th century, developed an empirical law of consumption. His paper, published in 1857, revealed an empirical law between income and expenditure of households based on the study of the conditions of production and consumption in the Kingdom of Saxony (in Central Europe) (Houthakker, 1957). He believed that the proportion of a nation's income spent on food is a good index of its welfare. Thus, with the rise in National Income, if a smaller portion is spent on food, then it would indicate that the country is developing. Subsequently, Prais and Houthakker (1955) studied Engel's law concerning the family budget data of U.K. Another study of Houthakker (1957) based on about 40 surveys across 30 countries with regard to household expenditure on food, clothing, housing, and miscellaneous items also confirmed Engel's Law.

All these studies indicate that when the money income of any individual or any family rises, then it spends a smaller proportion of its money income on consumption items. The present study aims to find out the applicability of Engel's law in India based on the Household Consumption Expenditure Survey data undertaken by NSSO during 2023-2024.

Literature Survey

Davide M. Difino (2024) highlights the nuanced relationship between economic progress, demographic changes, and household consumption patterns. The observation that an aging population leads to a higher food expenditure share is particularly insightful, as it counters the general trend of declining food share in total expenditures as income rises. Use of a quantitative, demand-side model strengthens the argument, providing empirical evidence that demographic evolution can slow down the shift away from food consumption. A study by Roy and Sarmah (2023) tested the validity of Engel's law using NSS 68th Round microdata. Their analysis employed a linear regression model, with household food expenditure as the dependent variable and total expenditure and household size as predictors. The findings confirmed that Engel's law holds for both rural and urban India, with food expenditure declining as income rises. However, certain income brackets exhibited spikes in food expenditure, likely due to shifts in consumption preferences toward higher-quality goods. Recent econometric studies have emphasized the importance of incorporating household size and demographic shifts into Engel curve estimations. The Working-Leser model remains a widely used approach for capturing non-linear relationships between food expenditure and income. Additionally, researchers have explored regional disparities in food consumption patterns, highlighting variations across socioeconomic groups. The Household Consumption Expenditure Survey 2022-23 Report - Analysis is a government report provides insights into changing food expenditure patterns in India. It highlights a decline in food share and shifts in consumption preferences, supporting Engel's hypothesis. Dhananjay Sinha (2024) in his article examines the latest Household Consumption Expenditure Survey (HCES 2023) and discusses how food expenditure has declined while spending on non-food items has increased, reinforcing Engel's law. Vyavahare and Deshmukh (2019) discuss changing food consumption patterns in India, highlighting a decline in food share and an increase in non-food expenditure over time. Bhavna Seth (2018) examines Engel's law in the context of household consumption in Orissa, confirming that food expenditure declines as income rises. It applies regression models to estimate the income elasticity of food. Roy, S. (2011) examines the changing consumption patterns across different economic classes in rural and urban India, highlighting disparities in expenditure on essentials, education, and medical services. Sethi and Pradhan (2012) analyse rural consumption expenditure in Western Odisha using Engel ratio analysis, highlighting shifts in food and non-food spending due to income and occupational changes. Their study underscores the impact of urbanization, rising per capita income, and evolving lifestyles on expenditure patterns. The findings reveal significant disparities across income groups, emphasizing the role of economic factors in shaping rural household consumption. Kumar, T Krishna, Mallick and Holla (2009), examine cereal consumption deprivation across rural and urban India before and during economic reforms, using Engel curve analysis to identify expenditure thresholds for deprivation. The study highlights disparities in consumption trends and their correlation with poverty measures. Mittal (2007), examines the factors influencing changes in cereal consumption across different expenditure groups in rural and urban India. The study identifies key

determinants such as own price effects, substitution price effects, income variations, and evolving tastes and preferences.

The reviewed studies analysed reveal significant shifts in cereal consumption influenced by economic transformations, income fluctuations, and changing consumer behaviour. These findings emphasize the wider impact of food policies, market structures, and strategies aimed at reducing poverty in India

Data Source and Methodology

Data on household consumption indicators, including Average Monthly Per Capita Expenditure (MPCE) and the Percentage Share of Food Expenditure (FE), has been gathered from the Survey of Household Consumption Expenditure Report for 2023-2024. For the descriptive analysis of yearly data, the statistical data on MPCE and the share of MPCE spent on food items for the rural and urban India have been collected from NSS 55th Round (1999-2000), NSS 61st Round (2004-05), NSS 63rd Round (2009-10), NSS 68th Round (2011-12) and NSS Survey on Consumption Expenditure Reports for 2022-23 and 2023-24 respectively. It is to be noted that for the years 1999-2000 and 2004-05, estimates are based on Mixed Reference Period (MRP) and for the years 2009-10, 2011-12, 2022-23 and 2023-24, these are based on Modified MRP (MMRP). Thus, there remains a problem of comparability of data. However, it would not distort the overall relationship that we want to establish between MPCE and the expenditure share of food items. Our cross-section analysis is based only upon the NSS Survey on Consumption Expenditure Report for 2023-24. Data on household consumption indicators, including Average Monthly Per Capita Expenditure (MPCE) and the Percentage Share of Food Expenditure (FE), has been gathered from the Survey of Household Consumption Expenditure Report for 2023-2024. This analysis focuses on both rural and urban areas across 18 major states, namely Andhra Pradesh, Gujarat, Haryana, Karnataka, Bihar, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Assam, Jharkhand, Chhattisgarh, Telangana and West Bengal, taking into account their diverse socio-economic and cultural contexts.

The relationship between regressor (the independent variable) and regressand (the dependent variable) is investigated and studied using simple linear regression analysis. The formula for the basic linear regression line is $Y_i = \beta_0 + \beta_1 X_i + e_i$, where X_i (viz. the average MPCE at constant prices for i -th State in case of cross-section analysis and for i -th year in case of time series analysis) is the independent variable and Y_i is the dependent variable (viz. the share of MPCE on food items). The constant term is β_0 . The simple linear regression equation's regression coefficient is represented by β_1 , while the model's random disturbance term is represented by e_i . The error terms are assumed to be normally distributed. The Ordinary Least Square Method (OLS) is used to estimate the aforementioned regression.

Analysis

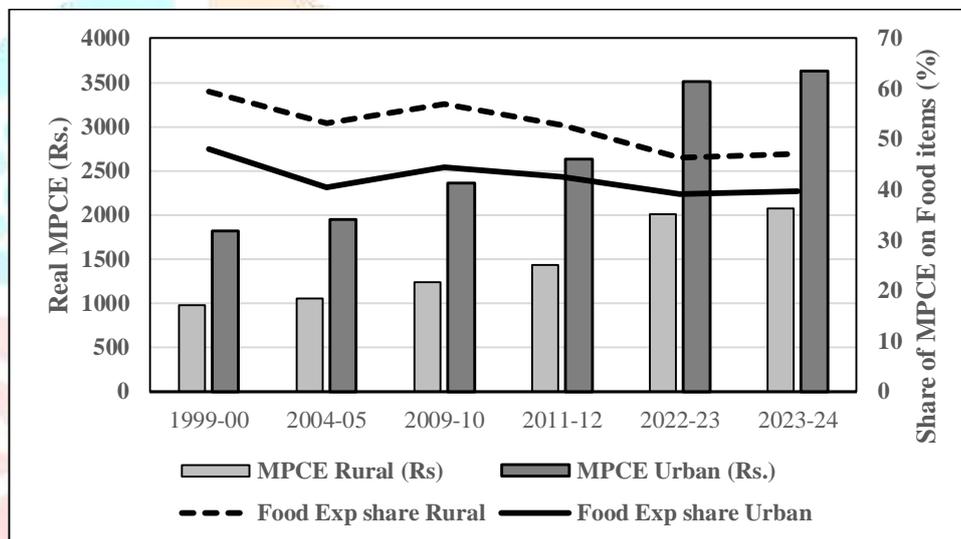
If we first look into the trend of MPCE (at constant 2011-12 prices) in rural and urban India during 1999-2024 we find that the real MPCE in both rural and urban India has gradually increased over time (Table-1) but it becomes evident that the gap between urban and rural MPCE has increased over time. This is an indicator of dualistic development in a society. Higher share of food expenditure in MPCE in rural areas implies the relatively higher marginal propensity to consume food items among the rural households as opposed to their urban counterparts. However, it is observed that the percentage share of expenditure on food items has been declining over time in both rural and urban areas (Table-1 & Fig.-1).

Table-1 Trend of Real MPCE and Share of Household Expenditure on Food Items in Rural and Urban India during 1999-2024

Year	MPCE Rural (Rs)	MPCE Urban (Rs.)	Food Exp share (%) (Rural)	Food Exp share (%) (Urban)
1999-00	978	1,823	59.4	48.06
2004-05	1,054	1,946	53.11	40.51
2009-10	1,239	2,358	56.98	44.39
2011-12	1,430	2,630	52.9	42.62
2022-23	2,008	3,510	46.38	39.17
2023-24	2,079	3,632	47.04	39.68

Source: Survey on Household Consumption Expenditure (2023-24), NSS Report-592, MoSPI, Govt. of India

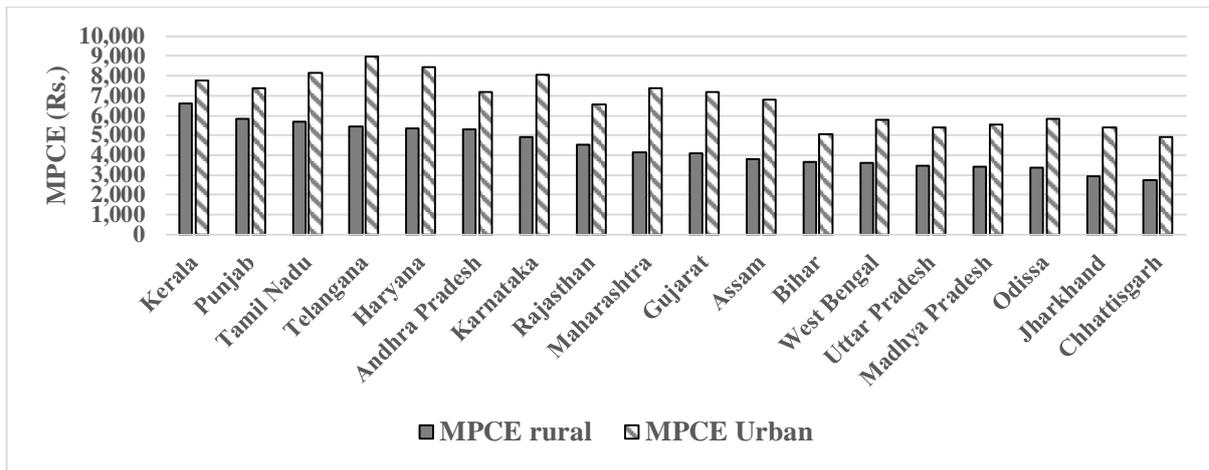
Fig.-1 Trend of Real MPCE and Share of Household Expenditure on Food Items in Rural and Urban India during 1999-2024



Source: Same as Table-1 (computed by the Authors)

Now, we can arrange the States in accordance with their relative position in MPCE in rural and urban areas in 2023-24 (Fig.-2). If we arrange the States in terms of their relative position in rural MPCE, States like Kerala, Punjab, Tamil Nadu, and Telangana come at the forefront, while the States such as Odisha, Jharkhand, and Chhattisgarh occupy lower positions in the ladder. Ranking of these States in terms of urban-MPCE also reveals almost a similar position of those States except few changes. The rank correlation coefficient is found to be 0.86, i.e., a highly positive rank correlation exists with regard to the rank positions of these States in terms of rural-MPCE and urban-MPCE.

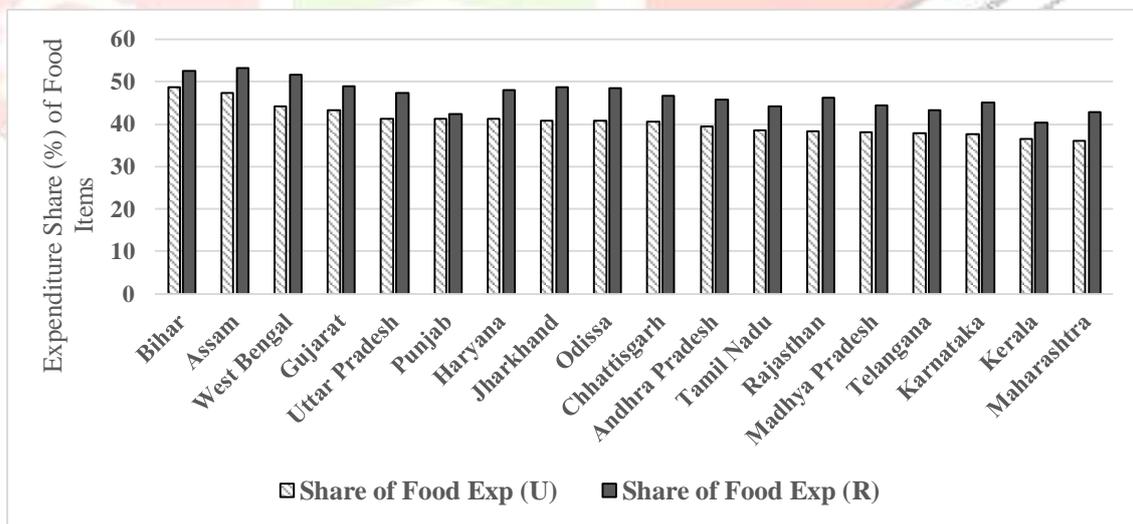
Fig.-2 MPCE in rural and urban areas across 18 States of India in 2023-24



Source: Same as Table-1 (Computed by Authors)

The ranking of those States can also be made on the basis of the expenditure share of food items in the average MPCE of rural and urban households in those States (Fig.-3). In this case, we find that expenditure share of food items in rural areas remains higher in States like Bihar, Assam, West Bengal and Gujarat, while the States like Maharashtra, Kerala, Karnataka and Telangana occupy relatively lower positions in this ranking. The ranking of these States in terms of expenditure share of food items in urban areas also indicates almost similar positioning of these States, as shown in the case of ranking in terms of expenditure share of food items in rural areas. In this case also, the rank correlation coefficient is found to be 0.81. In all these States, however, the share of food expenditure remains higher in rural areas compared to that of urban areas. Hence, the cross-section and the time series data (as shown in Fig.-1) reveal a similar pattern of expenditure behaviour.

Fig.-3 Expenditure Share of Food Items in rural and urban areas across 18 States of India in 2023-24



Source: Same as Table-1 (Computed by Authors)

Fig.-4(a) depicts this negative relationship between the average MPCE of rural households and the expenditure share of food items in MPCE during 1999-2024. It suggests that over time as the MPCE of any household rises in rural areas, the share of MPCE on food items declines gradually, and the household is supposed to spend more on non-food items. However, while taking into consideration the average MPCE, we are not considering the differences in MPCE across different fractile groups. For instance, the NSS household consumption expenditure survey (2023-24) shows that in 2023-24, the average MPCE of the top 5 per cent of the rural people (the richer section) remains about 6 times higher than that of the bottom 5 per cent of the rural people (the poorer section) in India. If this inequality in the distribution of MPCE is reduced then greater percentage of rural households who belong to lower income and

expenditure groups would be uplifted to relatively higher MPCE groups and their expenditure share on food items would fall, and this can also intensify the negative relationship between MPCE and the share of MPCE spent on food items. This inequality in the distribution of MPCE is found to be more unequal for urban areas in 2023-24 as the NSS household consumption expenditure survey (2023-24) shows that in urban areas the average MPCE of the top 5 per cent of the urban people remains about 8.5 times higher than that of the bottom 5 per cent of the urban people. Fig.-4(b) reveals a negative relation between the average MPCE of urban households and the expenditure share of food items in MPCE during 1999-2024 in urban India. Here, the absolute slope of this Engel curve reflects Marginal Propensity to Consume food items (MPC_f). Now, if we compare the absolute slopes of the Engel curves in Fig.-4(a) and 4(b) respectively, we find that MPC_f for urban households is comparatively less than that for the rural households. This is obvious because the percentage of households belonging to middle and higher expenditure class is supposed to be more in urban areas compared to that for rural areas.

Fig.-4 (a)-(d)

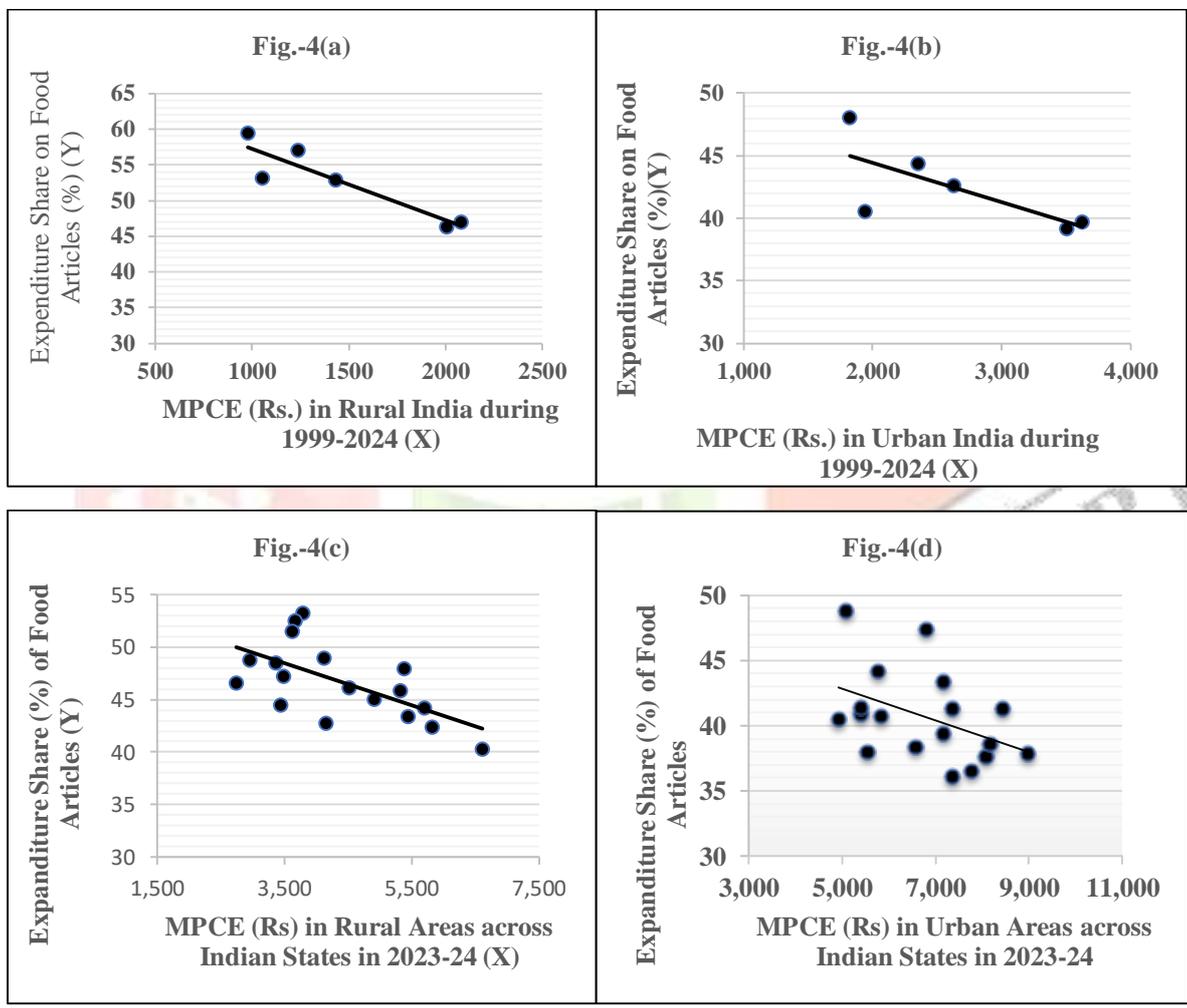


Table 2: Regresson Analysis of % share of food expenditure on MPCE in Rural India:

Regression equation: FE= 55.41 - 0.0019 MPCE							
R-square	F-change	Sig F change	Coefficient	Constant	Variable	t- value	Significance
0.389	10.2	0.005	-0.0019	55.41	MPCE	-3.19	0.006

Source: Author's calculation

Table-2 displays the regression equation for the study's independent variables, which are the average monthly per capita consumption expenditure (MPCE) of households and the percentage share of food expenditure (FE) as the dependent variable.

It demonstrates that the monthly per capita consumption spending of households as explanatory variables accounts for 38.4% of the variation in the percentage share of food expenditure in rural India. At 5% level of significance, it is found that the coefficients of the values of variable MPCE are significant and the whole model is also significant at 5% level. Therefore, it can be concluded that during our study period of 2023-2024, the percentage share of food expenditure in rural India was significantly impacted by the explanatory variable MPCE in the model (Table 2). In this case β_1 is 0.0019, meaning that FE falls by 0.0019 units for every unit increase in MPCE. Engel's law, which asserts that the percentage of income spent on food falls as income rises, is therefore established by the negative relationship between FE and MPCE.

Table 3: Regresson Analysis of % share of food expenditure on MPCE in Urban India:

Regression equation: FE= 48.8 - 0.00125 MPCE							
R-square	F-change	Sig F change	Coefficient	Constant	Variable	t- value	Significance
0.195	3.77	0.071	-0.00125	48.8	MPCE	-1.94	0.05

Source: Author's calculation

Table 3 displays the regression equation for the study's independent variables, which are the average monthly per capita consumption expenditure (MPCE) of urban households and the percentage share of food expenditure (FE) as the dependent variable. It demonstrates that changes in household monthly per capita consumption expenditures serve as explanatory factor that significantly explain 19.5% of the variation in the percentage share of food spending in urban India. At the 10% significance level, the entire model is significant. At the 10% level of significance, it is found that the coefficients of the values of the variable MPCE are significant. Therefore, it can be concluded that during our study period of 2023-2024, the percentage share of food expenditure in Urban India was significantly impacted by the explanatory variable MPCE in the model (Table 3). In this case, β_1 is 0.00125, meaning that FE falls by 0.00125 units for every unit increase in MPCE. Engel's law is established that is shown by a negative relationship between FE and MPCE.

In case of cross-section analysis also, we find such statistically significant negative relationship between average MPCE of the households and the expenditure share of food items in MPCE for the year 2023-24 in rural and urban areas. Here also we observe that the absolute slope of the Engel curve for the urban areas is a bit less than that for the rural areas implying again that the MPC_f of urban households is less than that of the rural households. However, in this case, the low value of R^2 suggests that the estimated coefficients of independent variables, despite being statistically significant, the explanatory variable cannot fully explain the variations in the explained variable. Lack of independent variables, i.e., other factors that affect the percentage of money spent by any household on food items such as the product price, the quantity bought, the household size, availability of government support and rationing etc. at a point of time across States could not be considered here.

Conclusion and Remarks

This examination of household spending trends in rural and urban India from 1999 to 2024 offers essential insights into the changing expenditure habits of Indian households. The results provide strong support for Engel's Law, which asserts that as household income rises, the proportion of income allotted to food declines, permitting more spending on non-food goods. Over the years, the real Monthly Per Capita Expenditure (MPCE) has steadily increased in both rural and urban regions, indicating an overall enhancement in consumption capacity. Nevertheless, the widening gap between rural and urban MPCE underscores a growing economic disparity, suggesting that urban households are advancing more rapidly in terms of their spending abilities. This growing gap indicates a two-fold pattern of development where

rural households, despite some economic advancement, continue to be relatively disadvantaged compared to those in urban areas.

A notable insight from the analysis of trends is the decreasing percentage of household Monthly Per Capita Expenditure (MPCE) spent on food. This pattern is observable in both rural and urban settings; however, rural households still dedicate a larger portion of their spending to food, illustrating the varying consumption priorities between the two regions. The rank correlation coefficients for rural and urban MPCE rankings (0.86) and food expenditure share rankings (0.81) highlight the stability in household spending patterns, with states exhibiting comparable rankings across different economic measures. The regression models indicate a statistically significant negative correlation between MPCE and the share of expenditure on food. Even though there are significant statistical connections, the relatively modest R-squared value found in urban regression models suggests that MPCE alone cannot completely account for the differences in food expenditure share, particularly among urban households. Other socio-economic and demographic elements- such as household size, price fluctuations, government aid programs, access to subsidized food, and infrastructure variations- are likely essential in influencing consumption patterns. These factors were not incorporated into the model due to data constraints, and their exclusion underscores the necessity for a more thorough approach to analysing consumption expenditure. Moreover, the significant disparities in the distribution of Monthly Per Capita Expenditure (MPCE) influence consumption trends. If these inequalities were addressed through inclusive economic initiatives, more rural families could move into higher spending categories, resulting in additional changes in their purchasing habits. The noticeable variations in the Marginal Propensity to Consume food (MPC_f) between rural and urban families, as demonstrated by the absolute slopes of the Engel Curves, further indicate that rural households allocate a greater percentage of their extra income towards food expenditure than urban households do.

Based on these results, subsequent research could utilize multiple regression analyses, incorporating various independent variables like food prices, household size, regional development strategies, and government assistance programs. This would allow for a more comprehensive understanding of consumption behaviours and assist policymakers in crafting interventions that more effectively tackle regional and income-related disparities. The findings of the study highlighted the necessity of addressing inequalities in the distribution of MPCE while recognizing the larger socio-economic factors that influence household spending patterns in India.

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