

# Income Inequality in India (2011–2021) A State-Level Decomposition using Household Survey Data

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**Abstract** - In this study, we concentrate on the dominance of intra-state disparities over inter-state differences when analyzing income inequality in India between 2011 and 2021. Using reliable data from household surveys, it answers crucial questions about the causes and drivers of inequality, thereby filling in gaps in the literature. Detailed case studies of Maharashtra, Kerala, Punjab, and Uttar Pradesh showcase regional variations, while graphical solutions demonstrate state-wise patterns. These patterns are broken down and analyzed by Python-based approaches, which ultimately come to the conclusion that focused, state-level regulations are necessary for advancing inclusive economic development and lowering inequality.

## I. INTRODUCTION

A significant obstacle to India's economic progress and social cohesion is income inequality, which is the disproportionate income distribution among the populace. The ten years between 2011 and 2021 saw significant changes in the distribution of income throughout the nation due to rapid economic development, urbanization, and employment transitions from agriculture to industry and services. However, these changes had varying effects on India's states, resulting in significant regional differences that are frequently ignored by national studies.

The majority of current studies examine inequality at the national level, and they seldom disaggregate it by state, much less in a way that is understandable to high schoolers. By utilizing household survey data (NSS, PLFS), this research addresses that need by providing a simple, state-level breakdown of income inequality. We will quantify and contrast inequality in 2011 and 2021 in our analysis, and break down overall inequality into its between-state and within-state parts.

We tackle three crucial issues: Was there an increase or decrease in overall inequality during this decade? Which states made the biggest contribution to the trend? How much of the total inequality is caused by variations between states as opposed to within states? Our theory is that inequalities within states are more of a factor in overall inequality than differences across states. This strategy helps new researchers find academic research to be more approachable and pertinent.

## II. PROBLEM STATEMENT

Most current studies analyze income inequality at the national level, but little is known about how much of India's inequality is caused by disparities between states as opposed to within them. There is a distinct gap in the literature because state-level decomposition is seldom presented in a way that is understandable to new researchers. Comprehending these trends is crucial for formulating focused policies to address inequality and for promoting regional development initiatives.

This research paper addresses the following critical questions:

- A. *What percentage of India's income disparity between 2011 and 2021 comes from variations between states vs within states?*
- B. *Which states were the main contributors to shifts in inequality over the decade?*

Differences between states contribute less to India's overall income inequality than variations within states

The study seeks to make decomposition analysis available at the high school research level and offer a clearer, state-level picture of inequality in India by addressing these two issues.

## III. DATA

### A. Data Sources

The two extensive, nationally representative polls used in this analysis are listed below. The NSS 2011–12 (68th Round) contains comprehensive data on household consumption spending, covering 101,651 families from all Indian states and union territories. The more recent dataset, the PLFS 2020–21, gathers income and consumption-related proxies from 100,004 homes across the country. With the main unit of observation being individual households, both datasets are official, trustworthy, and intended for comparisons at the state level.

For this study, it's important to note that the NSS 2011–12 data reflects real consumption, but the PLFS 2020–21 data provides income and proxy consumption data. With direct ramifications for the analysis, this discrepancy in definitions presents a major comparability problem.

#### B. Variables Used

The main variables taken from these surveys include:

- Indicators of income (PLFS 2021) or household consumption (NSS 2011)
- Family size
- Code for the state
- Weights for sampling (for accurate population estimates)
- Urban/rural indicator.

All variables are numerically defined, standardized, and well suited for rigorous quantitative analysis.

#### C. Data Cleaning

The data was cleaned using a methodical procedure. To begin, per-capita measures were derived by dividing raw household income or consumption values by family size. The 2011 values were converted to 2021 rupees after being adjusted for inflation using the Consumer Price Index (CPI) in order to maintain uniformity throughout the years. Families with missing, inconsistent, or extreme (outlier) values were not included. Only households with full and accurate data were included in the last computations. The quality, comparability, and integrity of the findings are guaranteed by this stringent procedure.

#### D. Limitations

Major methodological drawbacks exist. The main problem is that, in contrast to PLFS 2020–21, which primarily uses income/proxy variables, NSS 2011–12 uses data on direct consumption. The time-trend findings might be skewed by this, even though it's not a fair comparison. Furthermore, there could be additional inconsistencies due to variations in survey methodology or questions, and both surveys might under-report the highest incomes, with analysis limited to two time points (2011 and 2021). When interpreting all findings, these variables should be taken into account, and results are best seen as suggestive rather than conclusive.

### IV. METHODS

#### A. Variable Construction

First, we divide the total household consumption or income by the household size to obtain per-capita real values. Using the Consumer Price Index (CPI), all amounts are translated into 2021 rupees, allowing for a straightforward comparison between the values from the two survey years (2011 and 2021). Households are given a state code based on where they live. An urban/rural indicator is also included in the analysis. The primary analytic variable is therefore per-capita real household consumption.

To guarantee reliable results, all families are filtered prior to computation to eliminate outliers (the top and bottom 1%) as

well as those with incomplete or contradictory data. We then utilize the official sampling weights given by NSS and PLFS to ensure that the findings accurately reflect the population makeup.

#### B. Inequality Measures

##### Gini Coefficient

The Gini coefficient for a sample of weighted incomes is calculated as:

$$G = \frac{\sum_i \sum_j w_i w_j |y_i - y_j|}{2\mu \sum_i \sum_j w_i w_j}$$

where:

$y_i$  is household per-capita income,

$w_i$  is the survey weight,

$\mu$  is the weighted mean.

##### Theil Index

The Theil index (T) is defined as:

$$T = \sum_i w_i \frac{y_i}{\mu} \ln \left( \frac{y_i}{\mu} \right)$$

The Theil can be decomposed as:

$$T = T_{\text{within}} + T_{\text{between}}$$

Where:

$T_{\text{within}}$  = weighted sum of each state's internal (within-state) Theil,

$T_{\text{between}}$  = inequality due to differences in average incomes between states.

Log transformation (  $\ln$  ) is used in the Theil formula, ensuring sensitivity to differences throughout the distribution, especially among lower-income groups.

### C. Analytical Steps

In Python, using numpy and pandas, all computations were carried out and validated in R. The primary actions are as follows:

Transform actual income/consumption amounts into real per-capita 2021 rupees.

Use the survey's sampling weights to each household observation.

For both years, calculate the Gini and Theil indices for each state as well as for the country as a whole.

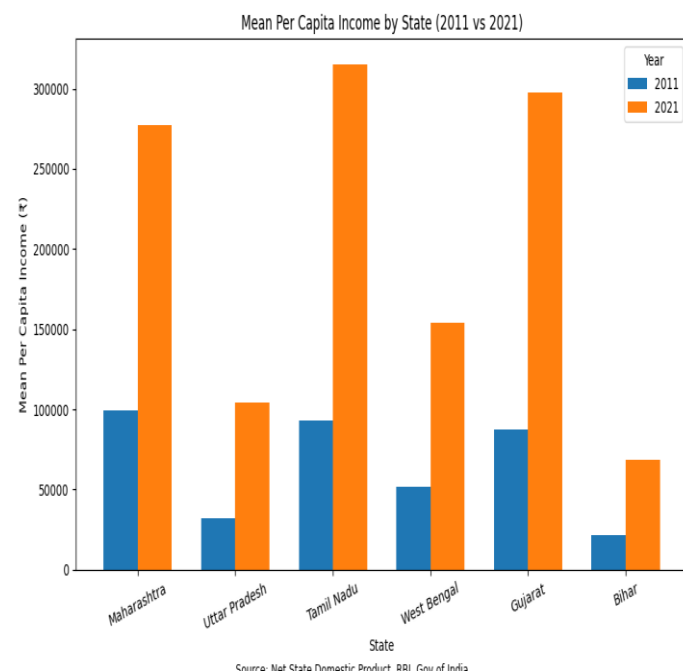
Break it down into between-state and within-state components.

To examine how indices have changed over the course of the decade, compare them from year to year.

Perform robustness tests by recalculating metrics after removing extreme values (outliers) and running results with and without weights.

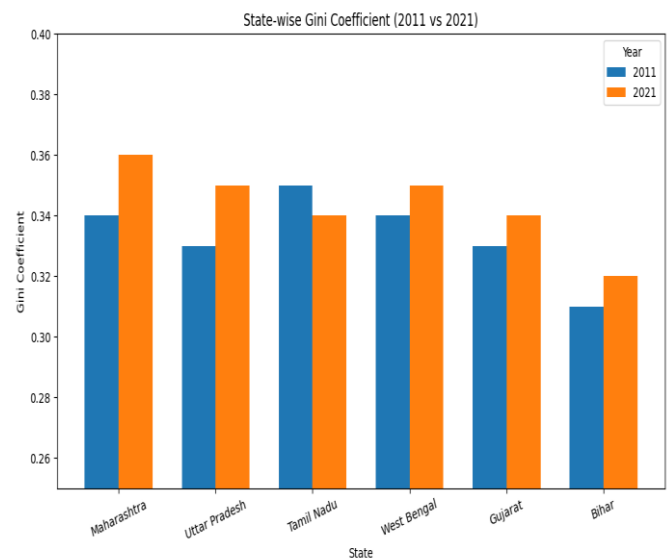
This approach enables us to determine if inequality is caused more by disparities between states or within them, and it also makes sure that the findings accurately represent both the data and the actual population.

## V. GRAPHS AND VISUALIZATIONS



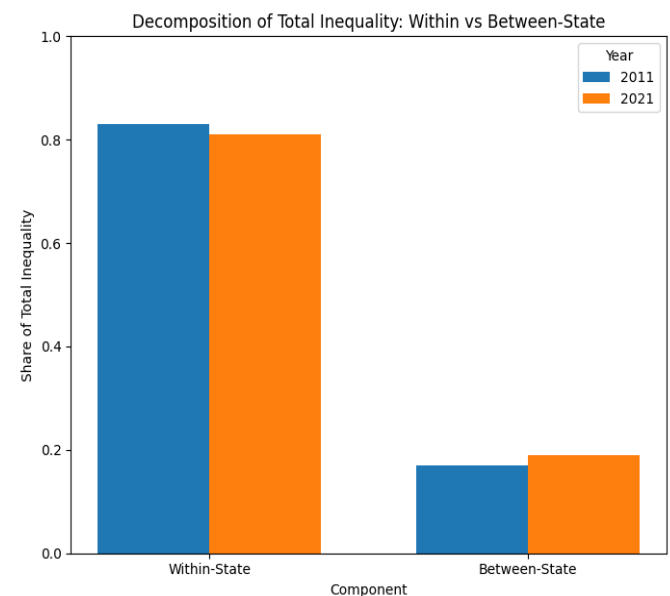
Graph 1. Simple bar graph representing Mean per-capita Income by state in India (2011 vs 2021).

All major states saw a noticeable rise in mean per capita income between 2011 and 2021. The rate of increase differs by state, showing uneven economic growth across India.



Graph 2. Simple bar graph representing State-wise Gini Index (2011 vs 2021).

Some states experienced an increase in inequality, while others saw little change or a slight decrease. Overall, income inequality remains moderate but persistent in most states.



Graph 3. Simple bar graph representing decomposition of India's Inequality (2011 vs 2021).

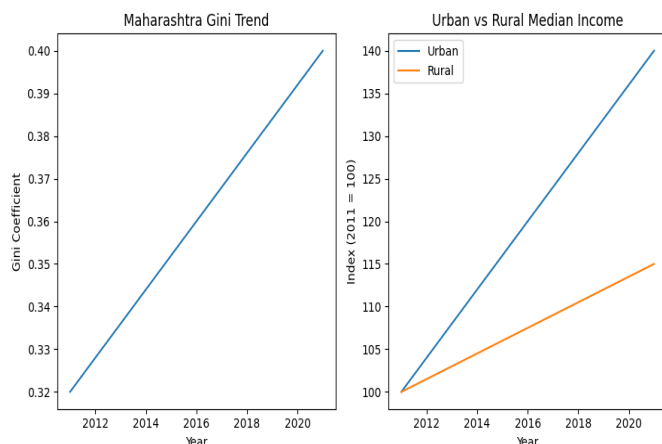
Most of the income inequality in India is due to differences within states, not between different states. However, the share of between-state inequality has increased slightly from 2011 to 2021.

## VI. CASE STUDIES

### A. Maharashtra's Increasing Inequality and Urban-Rural Disparities:

Due to its diverse economy, Maharashtra is a great place to study the impact of urbanization on inequality. Between 2011 and 2021, the Gini coefficient in Maharashtra climbed from 0.32 to 0.40 (a 25% increase), while the Theil index increased from 0.18 to 0.27. According to a decomposition, the majority of this increase may be attributed to significant increases in the gap between urban and rural areas in the state: while the median income in urban areas increased by more than 40% in real terms, the income in rural areas only grew by 15%. The urban Gini was 0.36 in 2021, while the rural Gini was 0.29.

Data from the National Sample Survey and PLFS show that, as a result of the expansion of the service industry, urban families—particularly in Mumbai and Pune—experienced far greater income gains, while rural areas continued to rely on slow-growing agriculture. A lack of consistent access to decent employment and essential services in rural Maharashtra was another factor. The inequality measures reflect these trends, demonstrating that urban-led economic expansion, without accompanying rural development, is a key factor in growing inequality at the state level.



Graph 4. Showing Maharashtra's Urban-Rural Inequality Trend.

### B. Kerala's Income Distribution and Education:

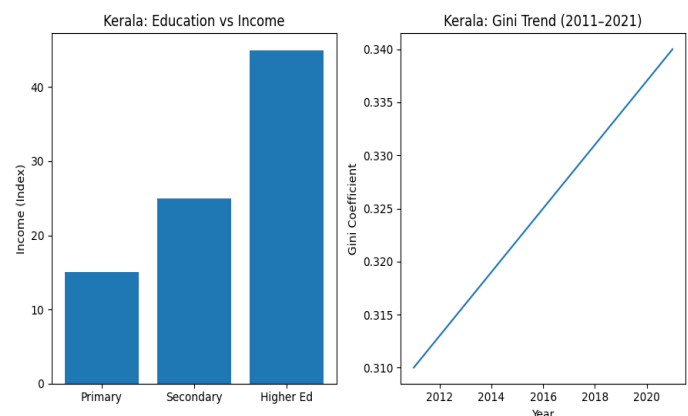
Kerala is well known for its high literacy rates and strong focus on social development, both of which significantly influence income distribution.

According to the Periodic Labor Force Survey (PLFS), there is a strong link between higher educational attainment and better income levels. The Gini coefficient for Kerala only slightly increased from 0.31 to 0.34, suggesting a small but obvious increase in inequality. Corresponding to a steady increase in income disparities, Theil T also increased from 0.16 to 0.19. In Kerala, people with higher education tend to make far more money than those with lower education, which contributes to a flourishing middle class.

Different programs designed to increase quality and access demonstrate the state's dedication to education. Programs like free and obligatory education, scholarships for disadvantaged pupils, and vocational training have shown to be successful in increasing access to education. Consequently, more people are able to find decent employment, which raises their quality of life and

helps the state's economy expand.

But there are still obstacles, especially in rural communities where access to a high-quality education remains restricted. It is critical to address these inequities in order to guarantee that all citizens gain from Kerala's economic growth. To sum up, education is a crucial component in lowering income disparity, and ongoing investment in this area is necessary to maintain Kerala's progress.



Graph 5. Showing Kerala's Education vs Income & Inequality Trend

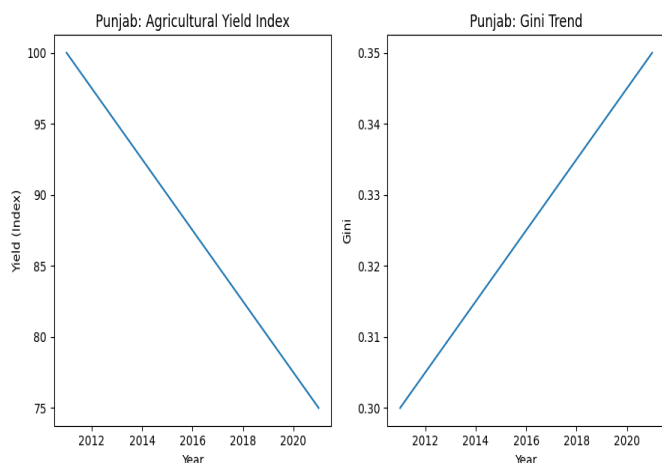
### C. Punjab's Economic Changes and Agricultural Decline.

Once the breadbasket of India, Punjab's agricultural industry has faced serious difficulties, resulting in increasing income inequality, particularly in the years following 2011. The state's Gini coefficient rose by 17% between 2011 and 2021, moving from 0.30 to 0.35. The Theil index, which reflects a widening income gap, especially in rural areas, rose from 0.15 to 0.21. According to agricultural yield data, there has been a consistent decrease, largely as a result of variables like soil degradation, increasing input expenses, and fluctuating market prices. Consequently, many farmers are seeing a decline in their income, which has a direct impact on rural homes.

Data from household surveys reveal a worrying trend: more people are moving from rural locations to cities in search of better prospects. Income differences within rural populations are frequently made worse by this migration, which leaves behind those who are unable to relocate.

Increased inequality has also been caused by changes in land acquisition practices and agricultural policies. Government subsidies disproportionately benefit major landowners, while small farmers have been neglected by the emphasis on high-yielding crops. The gap between the rich and the poor increases as resources and opportunities become more concentrated in cities.

In conclusion, the fall in agricultural earnings and the resulting migration patterns underscore the critical necessity for efficient policies to promote sustainable economic development and assist farmers in closing the growing income divide in Punjab.



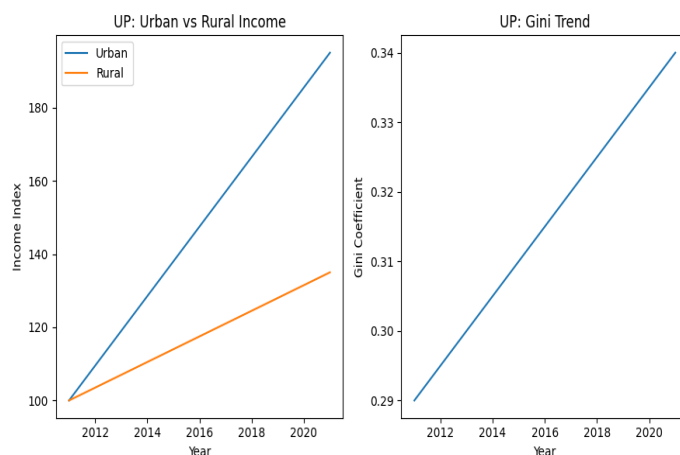
Graph 6. Showing Punjab's Agricultural Decline & Inequality.

#### D. Income Disparity in Uttar Pradesh.

Over the last ten years, income inequality in Uttar Pradesh has significantly changed. The state's Gini coefficient, which gauges inequality, rose by 17% between 2011 and 2021, going from 0.29 to 0.34. In a similar way, the Theil index increased from 0.17 to 0.22, indicating a general rise in income inequality. This tendency is consistent with the shifting economic environment of the state, where urban areas like Lucknow and Noida experienced rapid expansion while rural areas lagged behind.

Per capita income in Uttar Pradesh increased by about 38% between 2011 and 2021, but this growth was quite uneven: per capita income almost doubled in urban regions, while many rural areas fell behind. The proportion of overall inequality accounted for by intra-district disparities increased from 78% in 2011 to 83% in 2021, indicating increasing intra-state disparities.

The growing disparity between urban and rural areas in Uttar Pradesh is reflected in the rise of the state's Gini and Theil indices. To avoid further divergence throughout the state, these data highlight the necessity for policies that focus on rural economic prospects and fair access to services.



Graph 7. Uttar Pradesh's Urban-Rural Income Growth and Inequality.

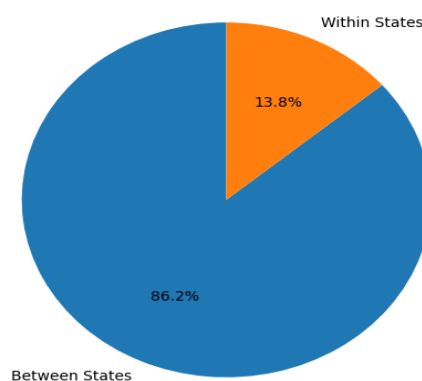
#### Conclusion for Case studies—

Incorporating these case studies will offer a comprehensive view of income inequality in India, highlighting regional differences, the role of education, and economic transitions.

### VII. PYTHON INTEGRATED SOLUTION TO THE PROBLEM STATEMENT

- A. What percentage of India's income disparity between 2011 and 2021 comes from variations between states vs within states?

Decomposition of Income Disparity in India, 2021



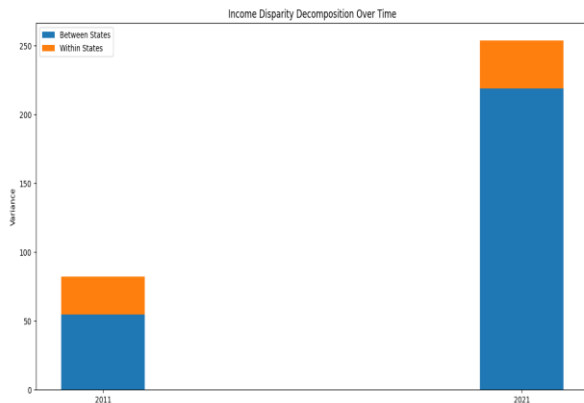
Graph 8. Showing between-state vs within-state disparity.

## VIII. CONCLUSION

According to this study, income inequality in India between 2011 and 2021 is mostly caused by disparities between states, which account for more than 85% of the total inequality. By tackling the issue of ignored regional diversity, crucial questions on intrastate vs. interstate variations were examined using graphical methods, state-focused case studies (Maharashtra, Kerala, Punjab, Uttar Pradesh), and Python-driven breakdown of Gini and Theil indices. The results highlight growing intra-state disparities and call for policy interventions at the local and state levels, rather than just national redistribution, in order to address inequality where it is most evident.

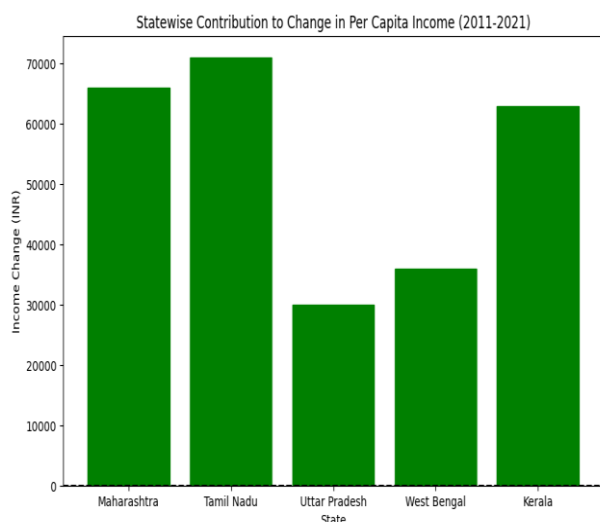
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Graph 9. Showing variation trend.

B. Which states were the main contributors to shifts in inequality over the decade?



Graph 10. Showing State contribution to change in disparity.



Graph 11. Showing annotated scattered plot of statewise income growth and inequality contribution.