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Decomposing Spatial Differences in Poverty in India

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Abstract

Over the last decade, India has been one of the fastest growing economies, and has experienced considerable decline in overall income poverty. However, in a vast country like India, poverty levels vary significantly across the different states. In this paper, we analyze the differences between poverty at the state and national level, separately for the rural and urban sector, in the year 1999-2000. Instead of following the usual practice of decomposing the changes in poverty over time, we decompose the changes in poverty across regions. Such decomposition reveals that differences in state and national poverty levels were largely explained by differences in the state and national mean income levels. Differences in the state and national distributions of income were less important in explaining spatial differences in poverty. An important policy implication of our results is that states with extremely high levels of poverty would have reduced …/…

Keywords: growth, income distribution, poverty, decomposition, India
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poverty significantly by raising their mean income levels to the national mean income, instead of changing their distribution of income to match the national income distribution.

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1 Introduction

India has long faced a problem of widespread poverty, and reduction in poverty levels has always been a major policy concern. India has the largest concentration of poor people in the world, with nearly 300 million people living in absolute poverty. However, since the economic reforms in the early 1990s, India has become one of the fastest growing economies of the world. Throughout the last decade, GDP per capita has grown at a rapid rate of about 4 percent per year. The rise in the average income levels has also led to a decline in income poverty in the country. Many recent studies show that the all-India level of poverty has declined considerably over the 1990s decade (Datt and Ravallion 2002; Dhongde 2002). However, in a vast country like India, poverty at the national level does not reflect significantly different poverty levels across different regions. For example, during 1999-2000 the all-India head count ratio of poverty was about 25 percent. But in rural Orissa, the head count ratio was as high as 41 percent, whereas in rural Punjab it was as low as 8 percent.

Given the vast differences in poverty levels across the country, it is important to understand the reasons underlying these differences. Do poverty levels across states differ because states have different mean income levels? If so, what would have been the poverty levels in the states if each state had experienced the same all-India mean income level? On the other hand, if the distribution of income also matters in determining poverty, then what would have been the poverty levels in the states if each state had a similar relative distribution of income, say the all-India distribution? In other words, what explains the difference in poverty levels across states, the difference in the mean level of income or the difference in the distribution of income? The paper tries to answer these important questions.

In order to analyze the differences in poverty levels across the country we decompose the differences in poverty levels. There have been some attempts in the past to decompose the total change in poverty over a period of time (Kakwani and Subbarao 1990; Datt and Ravallion 1992; Dhongde 2002). However in this paper, we decompose for the first time differences in poverty levels across states, within a country.[1] At a given point in time, for the year 1999-2000, we decompose the total difference between state and national poverty levels and measure how much of this difference is due to the difference between state and national mean income levels and how much of it is due to the difference between state and national distributions of income. The decomposition of poverty contributes important information, relevant to the ongoing debate about the impact of the rise in the mean income levels and changes in the distribution of income on poverty levels. It enables us to quantify the relative significance of the differences in state and national mean income levels as

[1] A recent paper by Kolenikov and Shorrocks (2003) is based on a similar decomposition of poverty across the regions in Russia.

compared to the differences in state and national distributions of income, in explaining the differences in state and national poverty levels.

Our analysis concludes that, in India, differences in poverty levels across the states were largely due to differences in their mean income levels. Differences in the distribution of income were much less important. The results imply that states with poverty levels higher than the all-India level could have reduced poverty significantly by raising the state mean income level to the all-India mean income. On the other hand, if the poorer states were to redistribute their income such that the distribution of income resembled all-India income distribution, without changing their mean income levels, poverty in these states would have increased further. On the whole, spatial differences in poverty were chiefly explained by spatial differences in the mean income levels rather than by differences in the distributions of income.

Another novel feature of the paper is the use of non-parametric kernel density to estimate poverty levels. The non-parametric method estimates income distribution directly, without assuming any particular functional form for the true distribution. The paper contains a brief discussion of the use of this new technique in estimating poverty.

The paper is organized as follows. Section 2 contains an explanation of the concepts involved in the decomposition of poverty. Section 3 contains a brief discussion of the non-parametric technique used to estimate poverty levels. The details of the data used in the study are given in Section 4. The results of the analysis are discussed in Section 5. Section 6 contains a summary of the conclusions.

2 Decomposition of poverty

The conventional notion of income poverty defines the poor as those people who earn income less than or equal to a benchmark level of income called the poverty line. Income poverty can be written as a function, $P(z,m,l)$, where z is the poverty line benchmark, m is the mean income level and l is the relative distribution of income, represented by the Lorenz curve.[2] Assuming a fixed poverty line, the poverty level in any state is given by $P(m_0,l_0)$ where m_0 is the mean income level of the state and l_0 is the Lorenz curve representing the relative distribution of income in the state.[3] Similarly, the poverty level of the nation as a whole is given by $P(m_1,l_1)$ where m_1 is the mean income level of the

[2] A Lorenz curve gives the relationship between the cumulative proportions of population to the cumulative proportion of income received when the population is arranged in an ascending order of income.

[3] Henceforth, for the sake of convenience, we will drop the word 'relative' and simply use the term 'distribution of income'. However, the reader is urged to note that a change or no change in the distribution of income is to be understood as a change or no change in the Lorenz curve representing the relative distribution of income.

nation,[4] and l_1 is the Lorenz curve representing the income distribution of the nation. Note that any poverty measure thus defined is independent of the number of people since the scale of the population affects neither the mean income level nor the distribution of income, i.e. the Lorenz curve. The difference between poverty at the national and state levels is simply:

$$\Delta P = P(m_1, l_1) - P(m_0, l_0)$$

The total difference in poverty at the two levels occurs because of a difference between the national and state mean income levels and/or a difference between the national and state distributions of income.

The decomposition analysis helps us understand how much of the total difference in national and state poverty levels can be attributed to a difference between the two mean income levels and how much of it can be attributed to a difference between the two distributions of income. In order to conduct the decomposition, we need to construct 'hypothetical' poverty levels. $P(m_1, l_0)$ tells us what would have been a state's poverty level if the state's mean had been the national mean, without any change in its distribution of income. On the other hand, $P(m_0, l_1)$ tells us what would have been a state's poverty level if there had been no change in the state's mean income level but its distribution of income had been the income distribution at the national level. Using these hypothetical poverty levels, the total difference between the state and national poverty can be decomposed in different ways. One way is to first change the state's mean income level and then change its distribution of income:

$$P(m_0, l_0) \rightarrow P(m_1, l_0) \rightarrow P(m_1, l_1)$$

Another way is to first change the state's distribution of income and then change its mean income level:

$$P(m_0, l_0) \rightarrow P(m_0, l_1) \rightarrow P(m_1, l_1)$$

The components of the decomposition obtained by following the first sequence will differ from those obtained by following the second sequence. Since there is no compelling reason to prefer one sequence to the other, we can take an average of their components. Thus, the difference between the national and state poverty levels arising purely from a difference between their mean income levels is given by:

$$\Delta P(m) = \frac{P(m_1, l_0) - P(m_0, l_0)}{2} + \frac{P(m_1, l_1) - P(m_0, l_1)}{2}$$

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[4] The national mean income level is equal to the population-weighted average of the state mean income levels.

where an average is taken of two components. The first component gives the difference in poverty due to changes in the mean income, when distribution of income is held fixed at the state level. The second component gives the difference in poverty due to changes in the mean income, when distribution is held fixed at the national level. Similarly, the difference between the national and state poverty levels arising purely from a difference between their distributions of income is given by:

$$\Delta P(l) = \frac{P(m_1, l_1) - P(m_1, l_0)}{2} + \frac{P(m_0, l_1) - P(m_0, l_0)}{2}$$

where an average is taken of two components. The first component gives the difference in poverty due to changes in the distribution of income, when mean income is held fixed at the national level. The second component gives the difference in poverty due to changes in the distribution of income, when mean income is held fixed at the state level. By taking averages of the two components, the decomposition no longer depends on the sequence in which the mean income level and the distribution of income are changed, i.e., the decomposition becomes path independent. Also, the changes in the mean income level and the changes in the distribution of income fully explain the total change in the poverty level, i.e., the decomposition is exact and has no residual.[5] Thus, the total difference in poverty can be decomposed into a mean component and a distribution component:

$$\Delta P = \Delta P(m) + \Delta P(l)$$

The following example illustrates the decomposition procedure explained above. In 1999-2000, in the rural sector of Bihar the head count ratio of poverty $P(m_0, l_0)$ was 40.62 percent while all-India head count ratio $P(m_1, l_1)$ was 25.19 percent. If Bihar had raised its mean income levels to the all-India income level, keeping fixed the state distribution of income, the head count ratio in Bihar $P(m_1, l_0)$ would have declined to nearly 17.19 percent. On the other hand, if Bihar had adopted the all-India distribution of income, keeping its mean level constant, the head count ratio $P(m_0, l_1)$ would have increased to 47.62 percent. Thus the total difference between national head count ratio and Bihar's head count ratio was:

$$\Delta P = 25.19\% - 40.62\% = -15.43\%$$

Out of this total difference, the average contribution of the mean component was:

$$\Delta P(m) = \frac{17.19\% - 40.62\%}{2} + \frac{25.19\% - 47.62\%}{2} = -22.93\%$$

[5] Shorrocks (1999) shows the links between this method of decomposition to the Shapley value solution in cooperative game theory. Footnote 3 in his paper asserts that this is the only method of decomposition which satisfies the following requirements: the decomposition to be path independent; the decomposition to be

The average contribution of the distribution component was:

$$\Delta P(l) = \frac{25.19\% - 17.19\%}{2} + \frac{47.62\% - 40.62\%}{2} = 7.50\%$$

3 Non-parametric estimation of poverty

In this paper, we decompose the head count ratio of poverty.[6] The head count ratio is the most common and easy to interpret measure of poverty. It gives the proportion of the population earning income less than or equal to the poverty line income level. The head count ratio can be obtained as a cumulative sum of the density of population earning income below the poverty line. Thus to calculate the head count ratio of poverty one needs to estimate the distribution of income. We estimate the distribution of income by using the non-parametric technique.

Given data on individual income levels in each state, one can estimate the income distribution by specifying a parametric functional form, typically a lognormal distribution. A disadvantage of the parametric method is the need to assume that the actual income density is indeed lognormal or some such function. This may not always be true. For example, most of the studies on India have employed a two parameter lognormal distribution to fit income distribution (Minhas et al. 1987). But the lognormal distribution tends to overcorrect the positive skewness of the income distribution and, thus, fits poorly to the actual data (Kakwani and Subbarao 1990). The non-parametric approach instead estimates distribution directly from the given data, without assuming any particular form.

Let $x_i \ (i = 1,2,....n)$ be a continuous random variable representing income. The density at any income level x given by $f(x)$, is estimated by the probability that x_i lies in an interval around x, say, $x - \frac{h}{2} \le x_i \le x + \frac{h}{2}$ where h is the width of the interval. Let $\phi_i = \frac{x_i - x}{h}$, then the interval can be rewritten as $-\frac{1}{2} \le \phi_i \le \frac{1}{2}$. A simple way to measure the head count ratio of poverty is by plotting the histogram. The histogram is a naïve estimate of income distribution and is given by:

$$\hat{f}_1(x) = \frac{1}{nh} \sum_{i=1}^{n} I\left(-\frac{1}{2} \le \phi_i \le \frac{1}{2}\right)$$

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complete; and the components of the decomposition to be given by the marginal effect of changing one factor, holding constant all the other factors.

[6] Although our analysis focuses on the head count ratio of poverty, it can be easily extended to include other poverty measures such as the poverty gap or the squared poverty gap.

where I is an indicator function. I takes the value one if ϕ_i lies in the above interval and takes the value zero otherwise. However, the histogram contains jumps at each income interval and so gives a discontinuous estimate of income distribution.

In order to obtain a continuous estimate of the distribution in a non-parametric way, a kernel is often used. The Rosenblatt-Parzen kernel estimate of the distribution is given by:

$$\hat{f}_2(x) = \frac{1}{nh}\sum_{i=1}^{n} K(\phi_i)$$

where K is a real positive kernel function satisfying the property $\int_{-\infty}^{\infty} K(\phi)d\phi = 1$ and $K(\phi)$ is small for large values of $|\phi_i|$. Since the properties that a kernel function is required to satisfy are similar to those satisfied by a density function, kernels are often chosen to be well-known density functions. In this paper, we choose the standard normal density function as the kernel:

$$K(\phi) = \frac{1}{\sqrt{2\pi}}\exp\left(-\frac{1}{2}\phi^2\right)$$

Optimal h is chosen such that $\hat{f}(x)$ is as close as possible to the true density, $f(x)$. The most common criterion is to minimize the integrated mean squared error given by $E\left[\int_{-\infty}^{\infty}\left(\hat{f}(x) - f(x)\right)^2\right]$. Using the criterion of minimizing the integrated mean square error to choose the optimal window width h we approximate h as $h \cong 1.06\sigma n^{-\frac{1}{5}}$ where σ denotes the standard deviation of income and n denotes the sample size.[7] Thus, we estimate income density by using the non-parametric kernel method. The head count ratio of poverty is obtained as the sum of the estimated densities, till the poverty line income level is reached. Tables 4 and 5 (later) show the estimated headcount ratios for each state in the rural and the urban sectors respectively.

4 Data

The difference between national and state headcount ratio is decomposed for a given point in time, namely, for the year 1999-2000. We chose this year, because it is the latest year for which the National Sample Survey (NSS) data is available. The National Sample

[7] Software packages which implement non-parametric density estimation (SAS, Shazam, STATA) use $h \cong 1.06\sigma n^{-\frac{1}{5}}$ as the default window width. For a detailed discussion on the choice of optimal kernel and window width, see Pagan and Ullah (1999).

Survey Organization is a unified agency under the Department of Statistics, Government of India, and is one of the chief agencies providing reliable data since 1972.

Although in the discussion in this paper income levels are used, the NSS data is available in fact on consumer expenditure levels. Hence, when estimating poverty, income is replaced by consumption expenditure. The expenditure series is not only more stable than the income series but also the difference between the income and expenditure series narrows down considerably for the poor. The NSS collects data at the household level and converts the household level data to per capita data by using an adult equivalence scale. We use the per capita consumption expenditure data from the 30-day recall schedule of the 55th round of the NSS, which is available separately for the rural and urban sectors of each state.[8] Out of a total of 26 states, our analysis includes 15 major states (Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal),[9] which account for nearly 97 percent of the total population of the country.

Table 1: Poverty line price deflator used for interstate price comparisons in 1999-2000

States	Rural Poverty Line	Deflator	Urban Poverty Line	Deflator
Andhra Pradesh	262.94	0.80	457.40	1.01
Assam	365.43	1.12	343.99	0.76
Bihar	333.07	1.02	379.78	0.84
Gujarat	318.94	0.97	474.41	1.04
Haryana	362.81	1.11	420.20	0.93
Karnataka	309.59	0.95	511.44	1.13
Kerala	374.79	1.14	477.06	1.05
Madhya Pradesh	311.34	0.95	481.65	1.06
Maharashtra	318.63	0.97	539.71	1.19
Orissa	323.92	0.99	473.12	1.04
Punjab	362.68	1.11	388.15	0.85
Rajasthan	344.03	1.05	465.92	1.03
Tamil Nadu	307.64	0.94	475.60	1.05
Uttar Pradesh	336.88	1.03	416.29	0.92
West Bengal	350.17	1.07	409.22	0.90
All India	**327.56**	**1.00**	**454.11**	**1.00**

Source: All the poverty lines used have been prescribed by the Planning Commission of India (http://planningcommission.nic.in). Deflator is the ratio of state poverty line to all-India poverty line.

8 The raw data of the 55th NSS round for the year 1999-2000 was made available by UNU-WIDER, Helsinki.

9 The states of Bihar, Madhya Pradesh and Uttar Pradesh refer to the ones before the formation of the new states of Jharkhand, Chattisgarh, and Uttaranchal in late 2000.

The data records per capita expenditure in each state at the nominal value. However, at any given point in time, prices differ significantly across states,[10] and, hence, nominal expenditure levels cannot be compared directly. In order to make meaningful comparisons across the states we adjust nominal expenditure levels by using the poverty line price deflator, i.e. the nominal expenditure levels in each state are scaled by the ratio of the state poverty line to the all-India poverty line. Table 1 gives the price deflators used to convert nominal expenditure levels to real expenditure levels for each state in each sector. Since expenditure levels across states are made comparable at the national level, all-India poverty line is used to measure the head count ratio in each state. An all-India rural poverty line of InR327 per capita per month is used to measure poverty in the rural sector of every state, and an all-India urban poverty line of InR454 per capita per month is used to measure poverty in the urban sector of every state.[11]

Table 2: Mean per capita expenditure levels across the states in 1999-2000

States	Rural Mean (InR)	States	Urban Mean (InR)
Punjab	725	Assam	1117
Kerala	712	Punjab	1105
Haryana	657	Haryana	1044
Tamil Nadu	613	West Bengal	1008
Andhra Pradesh	604	Tamil Nadu	952
Gujarat	592	Kerala	913
Karnataka	583	Gujarat	850
Rajasthan	547		
Maharashtra	534		
All India	**515**	**All India**	**841**
Uttar Pradesh	485	Andhra Pradesh	808
West Bengal	471	Maharashtra	808
Madhya Pradesh	463	Rajasthan	789
Orissa	415	Karnataka	786
Assam	405	Bihar	776
Bihar	404	Uttar Pradesh	751
		Orissa	676
		Madhya Pradesh	676

Source: Real mean levels are calculated by the author by using NSS data after adjusting for interstate price differences.

Table 2 shows the ranking of the states in terms of the real mean expenditure levels. In both the rural and the urban sectors, Punjab, Haryana and Tamil Nadu were among the rich states, while Bihar, Orissa and Uttar Pradesh were the poorer states. Compared to the urban

[10] Prices, especially those of food grains, may differ widely across states as free trade of agricultural products across state boundaries can be restricted by the state governments by enforcing the Essential Commodities Act (1955).

[11] These poverty lines have been prescribed by the Planning Commission of India.

sector, the rural sector had more number of states with mean income levels higher than the all-India average.

Table 3 shows the ranking of the states in terms of the Gini coefficient of the distribution of expenditure. The Gini coefficients are estimated from the raw data since no price adjustment is required for calculating the Gini coefficients. In Assam, Gujarat, Haryana and Rajasthan distribution of income was fairly equal in both the sectors, while Kerala, Maharashtra, Tamil Nadu and Karnataka had a relatively unequal distribution of income as measured by the Gini coefficient. It is rather surprising that in Kerala, especially in the rural sector, the Gini coefficient (0.32) was highest among all the states though Kerala also had high mean income levels and low poverty levels.[12] Although Kerala has often been cited for its commendable achievements in the fields of education and healthcare, it is rather surprising that there has been no mention in the literature of the high income inequality levels prevalent in the state.

Table 3: Gini coefficient of expenditure levels across states in 1999-2000

States	Rural Gini	States	Urban Gini
Kerala	0.32	Tamil Nadu	0.40
Tamil Nadu	0.31	West Bengal	0.36
		Maharashtra	0.35
All India	**0.28**	**All India**	**0.34**
Karnataka	0.28	Bihar	0.34
Maharashtra	0.27	Kerala	0.34
Madhya Pradesh	0.27	Karnataka	0.34
Punjab	0.27	Andhra Pradesh	0.33
Orissa	0.26	Orissa	0.33
Uttar Pradesh	0.26	Uttar Pradesh	0.33
Andhra Pradesh	0.26	Madhya Pradesh	0.33
West Bengal	0.26	Assam	0.31
Gujarat	0.24	Gujarat	0.30
Haryana	0.24	Rajasthan	0.30
Bihar	0.23	Punjab	0.29
Rajasthan	0.23	Haryana	0.28
Assam	0.22		

Source: Gini Coefficients are calculated by the author using NSS data.

12 The high Gini coefficient in rural Kerala is not a peculiarity of the data collected for 1999-2000, but it is persistently seen over the last few years. The Gini coefficient in rural Kerala was one of the highest in 1993-94 and was recorded as 0.3 in Dreze and Sen (2002). In 1983, too, rural Kerala's Gini coefficient was as high as 0.37, see Mishra and Parikh (1997). However, note that all the estimates of the Gini coefficient quoted above are based on the per capita consumption expenditure data of the NSS. Hence, the relatively widespread provision of public goods in Kerala as compared to the other states is not accounted for and so the Gini estimates of inequality are likely to be biased upwards.

Overall, in the rural sector, the mean income levels were positively correlated with the Gini coefficients (+0.5), indicating that poorer states had a more equal distribution of income compared to the richer states. In the urban sector, the correlation was weak. It was only slightly negative (-0.2) suggesting that richer states also had lower income inequality.

5 Decomposition results

Table 4 shows the decomposition of the head count ratio across the states in the rural sector, and Table 5 shows the decomposition of the head count ratio across the states in the urban sector.

Table 4: Decomposition of the head count ratio in 1999-2000 in the rural sector

States	Head Count Ratio in (%)	Total Difference	Mean Component	Distribution Component
Orissa	40.96	-15.77	-18.95	3.18
Bihar	40.62	-15.43	-22.93	7.50
Assam	37.46	-12.27	-21.38	9.11
Madhya Pradesh	32.96	-7.77	-9.54	1.77
West Bengal	28.35	-3.16	-4.87	1.71
Uttar Pradesh	27.43	-2.24	-5.54	3.30
All India	**25.19**	**0.00**	**0.00**	**0.00**
Maharashtra	21.96	3.23	1.79	1.44
Tamil Nadu	18.98	6.21	10.23	-4.03
Karnataka	16.38	8.81	7.58	1.23
Rajasthan	12.98	12.21	3.33	8.88
Kerala	12.88	12.31	17.41	-5.11
Gujarat	12.40	12.79	7.79	5.00
Andhra Pradesh	11.76	13.43	9.43	4.00
Haryana	8.40	16.79	12.90	3.90
Punjab	7.91	17.28	16.71	0.57

Note: Total difference is difference between the all-India and the state head count ratios.

Source: Decomposition values are calculated by the author by using equations in Section 2.

5.1 Worse performing states in the rural sector

In the rural sector, 6 out of 15 states experienced poverty levels higher than the all-India poverty level. These included the states of Assam, Bihar, Madhya Pradesh, Orissa, Uttar Pradesh and West Bengal. The decomposition of the difference between the state and national poverty levels shows that the main reason underlying the high levels of poverty in these states was the low level of mean income compared to the all-India mean income. If these states had raised their mean income levels to the all-India level without changing the distribution of income, poverty in these states would have declined below the all-India poverty level. On the other hand, if these states had changed the distribution of income to the all-India distribution, without raising the mean income levels, poverty in these states would have risen above their actual poverty levels.

Table 5: Decomposition of the head count ratio in 1999-2000 in the urban sector

States	Head Count Ratio In (%)	Total Difference	Mean Component	Distribution Component
Orissa	36.71	-11.73	-11.00	-0.72
Madhya Pradesh	36.47	-11.49	-13.23	1.74
Uttar Pradesh	29.88	-4.90	-5.98	1.08
Bihar	29.42	-4.43	-4.15	-0.29
Maharashtra	28.68	-3.69	-1.83	-1.86
Karnataka	27.20	-2.22	-3.15	0.93
Andhra Pradesh	26.35	-1.37	-1.95	0.58
All India	**24.98**	**0.00**	**0.00**	**0.00**
Tamil Nadu	23.81	1.17	2.92	-1.75
Rajasthan	21.39	3.59	-3.09	6.68
Kerala	20.25	4.74	3.73	1.00
Gujarat	17.82	7.16	0.54	6.63
West Bengal	16.49	8.49	8.45	0.04
Assam	9.54	15.44	10.38	5.06
Haryana	8.61	16.38	7.31	9.06
Punjab	6.90	18.08	9.90	8.18

Note: Total difference is difference between the all-India and the state head count ratios.

Source: Decomposition values are calculated by the author by using equations in Section 2.

For example, consider the state of Bihar (Table 4). The rural head count ratio in Bihar was 40.62 percent as compared to the all-India ratio of 25.19 percent. If Bihar had raised its mean income levels to the all-India income level, keeping fixed the state distribution of income, the head count ratio in Bihar would have declined from 40.62 percent to nearly 17.19 percent, which is lower than the all-India head count ratio. On the other hand, if Bihar had adopted the all-India distribution of income, keeping its mean level constant, the head count ratio would have increased to 47.62 percent, which is above the actual head count ratio in Bihar. Thus, in this sense, Bihar had a better distribution of income than all-India and high levels of poverty in the state were mainly due to low levels of income. In fact like Bihar, all the other poorer, worse performing states had a better distribution of income than all-India and the high poverty levels in these states were chiefly due to low mean income levels.

5.2 Worse performing states in the urban sector

In the urban sector, 7 out of 15 states experienced poverty levels higher than the all-India poverty level. These included the states of Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Orissa and Uttar Pradesh. All these states had mean income levels lower than the all-India level. Poverty in these states would have declined significantly had these states achieved all-India mean income level. However, instead of raising income to the all-India levels, had these states changed their distribution of income so that it resembled all-India distribution of income, poverty in the states would have increased. Thus, though the states had low income levels, distribution-wise most of the states were 'better off' than all-India.

Note that when the Lorenz curve of a state dominates all-India Lorenz curve, then the state not only has a lower Gini coefficient compared to all-India Gini coefficient but it also has a lower headcount ratio of poverty compared to the national head count ratio. However many times two Lorenz curves intersect each other. In such cases, comparing the Gini coefficients does not reveal if one economy has a lower head count ratio than the other. For example, Orissa had a lower Gini coefficient than all-India Gini coefficient. Given this fact, one would be tempted to think that if Orissa had adopted all-India distribution of income, poverty in Orissa would have increased. On the contrary, the decomposition analysis reveals that poverty in Orissa would have declined if it had adopted all-India distribution of income without changing the mean income level. This is because the Gini coefficient is a summary measure of inequality and it depends on the shape of the entire Lorenz curve, while the headcount ratio of poverty is calculated using only one segment of the Lorenz curve. In order to answer the counterfactual question of what would have been the poverty levels for different distributions of income, we need to calculate hypothetical poverty levels.

On the whole, in both the rural and the urban sector, it is seen that a rise in the poorer states' mean income level to the all-India level would have reduced the gap between the state and national poverty levels. However, if instead, the poorer states had adopted the all-India distribution of income without changing their mean income levels, the gap between the state poverty levels and the national poverty level would have, in most cases, increased further.

5.3 Better performing states in the rural sector

In the rural sector, 9 out of 15 states had poverty levels lower than all-India poverty level. The better performing states included the states of Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab, Rajasthan and Tamil Nadu. All of these states had mean income levels higher than the all-India mean income. In most of the states, the high mean income levels experienced by these states explained more than 50 percent of the total difference between the state and national poverty levels. Most of these states also had a more equal distribution of income than all-India, in the sense that keeping the mean income constant, if the states' distributions of income had changed to the all-India distribution, poverty in these states would have increased.

Important exceptions were the states of Kerala, and Tamil Nadu. Had these rich states changed their distribution of income to all-India distribution, without changing their mean income levels, poverty in these states would have declined. Thus, despite being richer than all-India, these states would have reduced their poverty levels further by adopting the all-India distribution of income.

5.4 Better performing states in the urban sector

In the urban sector, 8 out of 15 states had poverty levels lower than the all-India poverty levels. These included the states of Assam, Gujarat, Haryana, Kerala, Punjab, Rajasthan, Tamil Nadu and West Bengal. All of these states, except for Rajasthan, had mean income levels higher than the all-India mean income. But in richer states like Punjab, Haryana and Gujarat the high level of mean income was not the only reason for the low level of poverty. The distribution component of the decomposition was equally important. In other words, a substantial part of the difference between the state and national poverty levels was accounted for by the difference between the state and national distributions of income. Thus as noted earlier, the rich states also had a better distribution of income compared to the all-India distribution.

Another example where the distribution of income played an important role was in the state of Rajasthan. The mean income level in urban Rajasthan was lower than the all-India mean income. Yet poverty in this state was also lower than all-India poverty, due to a fairly equal distribution of income. Thus, in both the rural and the urban sectors, better performance of the states in terms of poverty levels was explained mainly because these states had higher than average mean income levels. In the urban sector, the lower poverty levels were also partly explained by a better distribution of income compared to the all-India distribution.

6 Conclusion

The performance of the states in terms of the mean income level, the distribution of income and the poverty levels varies significantly across India. In this paper we conduct, for the first time, a spatial decomposition of poverty to measure how much of the total difference in state and all-India poverty levels is due to a difference between their mean income levels, and how much of it is due to a difference between their distributions of income.

We find that the difference between the state and national levels of poverty is largely explained by a difference in the state and national mean income levels. In all cases, except urban Rajasthan, higher than average mean income levels implied lower than average poverty levels and vice versa. On the whole, differences in the state and all-India distribution of income were less important in explaining differences in poverty levels. However, there were a few important exceptions. Especially, in the urban areas of Punjab, Haryana and Gujarat, low levels of poverty were results of not only higher income levels, but also of a 'better' distribution of income.

The analysis has interesting implications. In 1999-2000, many states in India had a higher incidence of poverty compared to the all-India ratio. The number of poor in these states would have declined significantly had these states raised their mean income levels to the all-India level without altering the distribution of income. In contrast, had these states adopted the all-India distribution of income, without changing the mean income levels, poverty in most of the states would have increased. Of course, the question whether in each state the required changes in the mean income level and the distribution of income were politically feasible, remains open. Nevertheless, the decomposition analysis provides important information by revealing the fact that in India, differences in the state and national mean income levels were relatively more significant compared to differences in the distributions of income, in explaining the differences in state and national poverty levels.

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