



Multilevel Geographies of Poverty in India

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Summary. — Since the economic reforms in India in 1991, there has been a proliferation of studies examining trends of economic development and poverty across the country. To date, studies have used single-level analyses with aggregated data either at the state level or, less commonly, at the region and district levels. This is the first comprehensive and empirical quantification of the relative importance of multiple geographic levels in shaping poverty distribution in India. We used multilevel logistic models to partition variation in poverty by levels of states, regions, districts, villages, and households. We also mapped the residuals at the state, region and district levels to visualize the geography of poverty. We used data on 35 states, 88 regions, 623 districts, 25,390 villages and 202,250 households from the National Sample Survey in years 2009–10 and 2011–12. Our study found that geography of poverty in India cannot be fully explained by clustered distribution of poor households, and that there may be important contextual factors operating at the state and village levels. We found 13% of the variation in poverty to be attributable to states, 12% to villages, 4% to districts and 3% to regions, after accounting for important household characteristics. Similar variance partitioning was observed for rural and urban sample. The relative importance of one contextual level was highly sensitive to other levels simultaneously considered in the model. Findings from this study suggest that further explorations using multilevel modeling are warranted to identify specific contextual determinants of poverty at the state and village levels to reduce poverty and promote balanced regional development in India.

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1. INTRODUCTION

In 1991, the Indian government initiated economic reforms, which transformed the country to an open economy with greater reliance on market forces, expanded the role for the private sector, and restructured the role of government (Ahluwalia, 2002a). Since then, there has been a proliferation of studies examining the trends of economic development, poverty and inequality across the country. As a result of policy decentralization, state-level reforms and other development, the proportion of population living below the poverty line in India (Tendulkar estimates) has declined from 45.3% in 1993–94 to 21.9% in 2011–12 (Planning Commission, 2013), but this was accompanied with increasing growth differentials by states and urban/rural sectors (Baddeley, McNay, & Cassen, 2006).

To date, studies exploring the geography of poverty in India have largely focused on the state-level performances in respect to different measures of poverty, economic growth, income, multiple deprivation and inequality (Alkire & Seth, 2015; Baddeley *et al.*, 2006; Bhattacharya & Sakthivel, 2004; Choudhury, 1992; Dev & Ravi, 2007; Himanshu, 2007; Sundaram & Tendulkar, 2003). Given the enlarged scope for state-level initiatives, especially in terms of attracting investment and influencing irrigation and agricultural practices, prior assessments of poverty in India have naturally skewed to focus on the state level (Ahluwalia, 2000). Overall, these studies have consistently reported significant variations, and even increasing variation over time, both across and within states on their respective outcome measures. By focusing on this single level of states and treating it independent of other higher and lower levels, many of the prior studies have implicitly or explicitly advocated states to be the primary target for developmental policies and investments.

However, limitations of state-level analyses have been critically noted, and regions have also received some attention in poverty literature in the late 1990s and early 2000s because

agricultural growth and rural poverty reduction were shown to be highly dependent on the underlying agro-ecological conditions. That is, within the same state, regions with agro-climatic conditions favorable to the spread of irrigation and agricultural development tended to experience faster poverty reduction (Chauhan *et al.* 2015; Dreze & Srinivasan, 1996; Palmer-Jones & Sen, 2003, 2006). More recently, there were three studies examining smaller geographic level of poverty, namely districts, which have been hypothesized to be more useful than states in formulating district-specific development policies in the Indian context (Wanmali & Islam, 1995). A study by Chaudhuri and Gupta concluded that disparity among the districts within each state was even more glaring than the substantial disparity observed among the state-level poverty and the monthly per capita consumption expenditure (MPCE) (Chaudhuri & Gupta, 2009). The most recent study using district-level per-capita income data from 29 Indian states concluded that there was no divergence in inter-district income disparity between 1999–2000 and 2005–06 (Banerjee, Banik, & Mukhopadhyay, 2015).

In short, studies describing, monitoring and providing surveillance data on the general trends of poverty in India have relied on single-level analyses with aggregated data either at the state level or, less commonly, at the region or district levels. The importance of controlling for the underlying compositional factors, such as ethnicity, literacy, and agrarian structure, and the potential benefits of considering multiple levels of geography have been discussed in prior literature (Palmer-Jones & Sen, 2003), but has never been empirically assessed to date. Moreover, while previous studies have accounted for clustering at the village (primary sampling unit (PSU)) level, none have attempted to empirically quantify the extent to which this level contributes to the geography of poverty in India. Although

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states, regions, and districts each represent important political, agro-ecological and administrative units, treating each independent of other levels may result in an incomplete and misleading understanding of the geography of poverty for several reasons (Goldstein, 2005; Moellering & Tobler, 1972; Raudenbush & Bryk, 2002; Subramanian, Duncan, & Jones, 2000; Subramanian, Duncan, & Jones 2001).

First, single-level studies implicitly or explicitly assume that level to be a homogeneous unit, but this expectation is highly implausible. In general, Indian states are physically much larger than most developing countries, and hence it is more realistic to expect complicated regional divergence on economic growth and poverty reduction within states. Indian districts, which are the smallest geographic level considered in poverty literature thus far, are also far from being homogeneous. In fact, many studies have already noted spatial inequalities at all levels of disaggregation (Mehta & Shah, 2003; Singh, Bhandari, Chen, & Khare, 2003). Just as between-state inequality can be detrimental to national poverty reduction, within-state distribution of poverty can also retard overall development.

Second, the relative importance of one level can be truly examined only when multiple relevant levels are concurrently considered in the analysis. It is highly plausible that influences at multiple geographic levels act simultaneously to shape the distribution of poverty. For this reason, the observed significant variation in poverty at the state level, as identified by many single-level studies, may attenuate after including other substantively meaningful smaller geographies, such as regions, districts and villages.

Third, significant variation resulting from a single-level ecological analysis may be confounded by the underlying compositional effects. For instance, some states may appear to be poor on average mainly because of geographically clustered households with higher risk of poverty in terms of sociodemographic characteristics. If this is the case, then the between-state variation in poverty will substantially attenuate after adjusting for household attributes such as type of residency (urban/rural), caste, primary source of income, and education level of the household head. On the other hand, if variability at the state level remains high even after adjusting for important household-level predictors, then this may indicate true contextual effect of states on poverty.

Despite the potential insights that multilevel perspective may offer, no comprehensive empirical assessment exists to quantify the relative contribution of multiple levels in shaping the geography of poverty in India. To address this critical gap in current literature, this study uses multilevel modeling to assess whether geography of poverty in India is simply a consequence of clustered poor households or is independent of such clustering. This paper first partitions the total variation in poverty by five meaningful levels of states, regions, districts, villages (PSUs), and households. Then, more detailed geographies at each level are provided, and hotspots of high poverty concentration are identified. Residuals at the district-, region-, and state-levels are mapped to visualize the geographic disparity in poverty within and across different levels. To our knowledge, this is the first study to provide a comprehensive examination of multiple levels of geography of poverty in India. If the variations at higher geographic levels remain substantial even after accounting for clustered distribution of poor households, then our findings would indicate that there is a strong contextual effect on poverty over and above compositional effects. Additionally, while districts have been the smallest unit of analysis considered thus far, a new micro level (villages) representing the local environment is incorporated in our analysis. Findings from this study may have important

implications as to which contextual level(s) should be prioritized to reduce poverty and economic inequality in India.

2. METHODS

(a) *Data and sampling plan*

We used the unit data from the consumption expenditure schedule of 66th and 68th round of the National Sample Survey (NSS). The NSS was set up by the Government of India in 1950 to collect detailed information on various socioeconomic and health aspects of the population through population-based surveys. The survey used a stratified, multi-stage cluster design in each state and provides reliable estimates at state and for rural and urban areas. The Primary Sampling units (PSUs) were census villages for the rural sector, and the urban frame survey blocks for the urban sector. In case of large PSUs, one additional intermediate stage of sampling was employed before selecting the households. Households were selected using the method of circular systematic sampling. Further details about the sampling design of the NSS have been described elsewhere (Note on Sample Design and Estimation Procedure: NSS 66th round, 2010). The 66th and 68th round of consumption schedule (1.0) of the NSS data correspond to years 2009–10 and 2011–12 respectively, which are the most recent, comprehensive and higher quality dataset reflecting multiple levels of hierarchical nesting structure in India.

(b) *Study population and sample size*

The 66th round of the NSS collected data from 100,794 households in year 2009–10 and 68th round covered 101,651 households in 2011–12. While there were 640 districts as per the census of India in 2011, we used 623 districts covered in the NSS. For instance, two districts of Uttarakhand in the NSS, namely Nainital Hill and Nainital Plain, were considered as a single district (Nainital) in the analyses. Similarly, Dehradun Hill and Dehradun Plain were considered as a single district of Dehradun in our analysis. Of the 202,455 households (pooled sample), 195 were excluded for missing information on the following variables: 75 on type of residency, 33 on caste, 25 on education level of the household head, 24 on primary source of income, 24 on land ownership, 9 on marital status of the household head, and 4 on religion. One household was further removed for having implausible value for the proportion of dependents. The final analytic sample comprised of 202,250 households (Figure 1).

(c) *Geographic levels*

Four geographic levels were considered in our analysis because each had specific political, administrative, social, and agro-ecological importance that could potentially influence the risk of poverty at the household level (level-1).

States (level-5) are the political unit at which federal polices operate. Since liberalization in the early 1990s, many of the controls that had been exercised by the central government were eliminated, and politics in India became increasingly regionalized with rising role of the state government (Baddeley *et al.*, 2006).

Regions (level-4) in the NSS are groups of contiguous districts within states (Palmer-Jones & Sen, 2003). Regions may be particularly informative in explaining within-state variation in rural poverty because they are crudely associated with agro-ecological conditions, which refer to the geographical

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