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Mobility during 1987-2012**

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ABSTRACT

Welfare Dynamics in India over a Quarter Century: Poverty, Vulnerability, and Mobility during 1987-2012*

We analyze the Indian National Sample Survey data spanning 1987/88–2011/12 to uncover patterns of transition into and out of different classes of the consumption distribution. At the aggregate level, income growth has accelerated, accompanied by accelerating poverty decline. Underlying these trends is a process of mobility, with 40–60 percent of the population transitioning between consumption classes and increasing mobility over time. Yet, the majority of those who escape poverty remain vulnerable. Most of those who are poor were also poor in the preceding period and, thus, are likely to be chronically poor. The characteristics of upwardly mobile households contrast with those of the poor; these households are also far less likely to experience downward mobility. We also find that states exhibit heterogeneous mobility patterns.

JEL Classification: C15, I32, O15

Keywords: intra-generational mobility, welfare dynamics, imputation, synthetic panel, India, National Sample Survey

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I. Introduction

Income distribution as a topic of analysis and measurement has mushroomed in recent decades, since Anthony Atkinson argued in his presidential address to the Royal Economic Society in 1997 that the subject should be ‘brought back in from the cold’ (Atkinson 1997). There has been a veritable explosion of interest in the subject among researchers, policy makers, and commentators alike. A virtual industry has emerged focusing on the documentation and analysis of inequality trends at the national and global levels. The interest has been spurred in both the developed and the developing world.

While there has been much progress in the production of inequality statistics around the world, offering expanding opportunities to track trends over time and to make comparisons across countries, the underlying processes that characterize changes in inequality merit further and continued investigation. Notably, it is still rarely the case that the patterns of relative income mobility that underpin changes in inequality are documented, let alone well understood, particularly for developing countries. And yet the normative view one takes of a rise in inequality may differ depending on whether one is observing a simple stretching out of the income distribution—leaving individuals in the same position within the distribution—or the increased inequality is accompanied by individuals or households moving up and down in relative terms within the income distribution. As noted by Paul Krugman, ‘if income mobility were very high, the degree of inequality in any given year would be unimportant, because the distribution of lifetime income would be very even’ (Krugman 1992 00).

Assessing the degree of income mobility poses significant data and measurement challenges. In particular, it is necessary to work with panel data, as only such data permit the tracking of households over time. Collecting such data, however, can be very costly, and can also pose logistical and capacity-related challenges. These constraints are particularly acute in developing countries. The scarcity of panel data has thus rendered the analysis of welfare dynamics difficult, if not impossible, in many developing country settings.

We investigate in this paper patterns of welfare dynamics in India over the quarter-century between 1987 and 2012. In doing so, we build on an earlier study by Dang and Lanjouw (2018) that focuses on mobility during the 2000s. Similar to this study, we attempt to overcome a set of empirical and methodological challenges that bedevil analysis of this kind in the Indian setting. Recognizing that the debate about the evolution of welfare outcomes such as poverty in India has been overwhelmingly centred on consumption as the preferred indicator of economic well-being, we base our study on the nationally representative National Sample Survey (NSS) consumption surveys that are regularly fielded by the Indian National Sample Survey Office. This contrasts with most extant studies of mobility in India, which draw on income data from the Indian Human Development Surveys (IHDS) fielded by the National Council of Applied Economic Research (NCAER) and the University of Maryland.¹ We tackle the formidable analytical hurdle posed by the fact that India’s NSS surveys are cross-section surveys rather than panel surveys, by implementing a procedure to construct synthetic panels from the NSS surveys.

Yet, our study significantly extends the scope of analysis by Dang and Lanjouw (2018) in both breadth and depth. In terms of breadth, we expand the time window of analysis to the preceding two decades by comparing mobility in the 2000s against mobility that can be observed during the late 1980s and 1990s. In particular, we analyze five ‘thick’ (large-sample) rounds of the NSS for 1987/88, 1993/94, 2004/05, 2009/10, and 2011/12. In doing so, we comment not just on the extent of consumption mobility in India, but also on changes in mobility over time—a question of considerable interest, since this quarter-century has seen the introduction of a host of economic reforms, significant transformation of the Indian economy, and a dramatic acceleration of economic growth and poverty decline. This much longer time

¹ We return to more discussion of the differences between the NSS and IHDS in the next section.

horizon allows us to uncover more nuanced differences in the dynamics in these different decades. Indeed, to our knowledge, we are the first to attempt such a long-term analysis of mobility for India.

Regarding depth, while Dang and Lanjouw (2018) mostly focus on poverty mobility between the poor and the non-poor, we offer a richer analysis in this paper of mobility patterns for three different income groups consisting of the poor, the vulnerable, and the secure (whom we might also denote as the ‘middle class’). Dividing the population into these groups, rather than the more conventional breakdown into deciles, quintiles, or terciles, offers an additional level of insight into the underlying patterns observed, and allows us to relate our discussion to the large literature on poverty in India. We distinguish the vulnerable from the secure via a method introduced in Dang and Lanjouw (2017), whereby we identify a subset of the non-poor that has a consumption level above the poverty line but faces a heightened risk of falling into poverty in the next period. But for comparison purposes, and to gauge the overall robustness of our findings, we also report findings on mobility based on quintile-based transition matrices. These more refined disaggregations of the population groups are more relevant to policy advice than one might think, especially since attention has been increasingly placed on vulnerable population groups for more sustainable poverty reduction.²

Moreover, we take advantage of the large sample size of the NSS surveys not just to explore patterns of mobility at the all-India level, but also to consider patterns of welfare dynamics at the state level—recognizing that the forces and policies at work in the Indian economy have often been different and uneven across states. We also examine differences between urban and rural areas and among population groups defined in terms of education levels, occupation sectors, and caste. The combination of a longer time horizon and more disaggregated state-

² For example, the United Nations has called for more rights to economic resources and access to basic services both for the poor and the vulnerable in the Sustainable Development Goals (SDGs).

level analysis yields new and interesting policy patterns about the dynamics of welfare over time.

Incidentally, we present further validation of the synthetic panel method, which is predicated on certain underlying assumptions. While we are unable to test these assumptions directly with the NSS data, we probe them by validating our methodology with the IHDS data—the one nationally representative panel data set that has been collected in India in recent years. Seeing that the method works well in replicating true panel estimates from the IHDS further adds to the existing validation studies that analyze data from other countries.³ These offer us scope to comment on patterns of per-capita consumption mobility based on the synthetic panels constructed from the NSS data.

To preview our findings, our analysis indicates that as economic growth in India accelerated in the late 1990s and 2000s, consumption mobility also increased: a larger share of the poor in the later survey years was able to transition out of poverty than in the first half of the study period. Chronic poverty declined. Less encouraging, however, is that relatively few of the poor were able to escape poverty to the extent that they were able to join the secure—i.e. the group that is neither poor nor vulnerable to falling back into poverty. Even in the second half of the study period, transitioning out of poverty and directly into the ‘middle class’ was a very rare occurrence. While fewer people dropped back into poverty over time than managed to escape poverty, it remains important to note that downward mobility was not entirely absent. Indeed, focusing on the characteristics of the population that moved up or down in relative terms reveals that forward castes (neither Schedule Castes and Schedule Tribes, nor Other Backward Castes) exhibited a particularly high propensity to move up in relative rankings. In contrast, Scheduled Castes and Scheduled Tribes were much more likely to see their relative

³ See Dang, Jolliffe, and Carletto (2019) for a recent review of studies that validate and employ the synthetic panel methods.

position decline. These patterns of upward and downward mobility across population groups have shown some attenuation over time but have not disappeared. Mobility patterns are more heterogeneous across the states, but are qualitatively similar to the national trends within the states.

We offer a review of the literature in the next section. In Section III we provide a brief overview of the methods employed for the construction of synthetic panels, and for specifying the vulnerability line. We subsequently gauge in Section IV the validity of the synthetic panels methodology by implementing it in the IHDS survey. Section V reports our main findings on mobility trends at the national and state levels and for different population and consumption groups. We offer concluding remarks in Section VI.

II. Literature Review

The last quarter-century has seen gross domestic product (GDP) per capita rise significantly in India. As seen in Figure 1, the study period can be readily divided into two periods: in the first, extending up to around 2002, GDP per-capita growth rates were generally below 6 percent per annum (with two exceptions); thereafter, growth accelerated and generally ranged between 6 and 8 percent per annum. As documented by Datt and Ravallion (2011) and Ravallion (2011), there was considerable attention to poverty trends in India following economic reforms introduced in the early 1990s. However, the evidence suggests that the pace of poverty decline started to increase dramatically only during the 2000s, after the 2004/05 round of the NSS, and in particular between 2009/10 and 2011/12.⁴ Interestingly, the dramatic falls in poverty between 2009/10 and 2011/12 occurred when per-capita growth rates were in fact lower than in the 2004/05–2009/10 interval (Figure 1).

⁴ Dang and Lanjouw (2018) explore the possibility that the marked acceleration in measured poverty decline between the last two survey years might have been driven by changes in survey methodology, but they conclude that this is unlikely to have been the case.

Himanshu (2019) documents trends in Indian inequality between the early 1980s and the present. He shows that while rates of poverty decline and economic growth were impressive during this period, particularly post-2000, measured real per-capita consumption inequality rose only modestly, with a Gini coefficient of just around 0.28 in 1993/94, rising to about 0.33 in 2011/12. The largest increase in measured inequality occurred between 1993/94 and 2004/05, rather than in the high-growth 2000s. Himanshu (2019) goes on to note the current debate in India, raised by recent analysis by Chancel and Piketty (2019), concerning the likely understatement of measured inequality in the NSS surveys due to under-representation of, and possible under-reporting by, the top segments of the consumption distribution in the NSS surveys. Chancel and Piketty (2019) employ a variety of adjustment methods to estimate present-day levels of income inequality in India, which compare to those prevailing at the height of the British Raj in the early 20th century. While the precise level of inequality is difficult to ascertain given the data constraints, the evidence suggests that some increase in inequality did occur alongside the growth in incomes and decline in poverty.

It is unlikely that the structure of economic growth in India from the late 1980s to the present took the form whereby all persons enjoyed rising welfare levels without seeing their relative position in the consumption distribution change. As Deng Xiaoping is reported to have noted in relation to the likely impact of the market-oriented reforms he launched in China, ‘some get richer before others’ (see discussion in Himanshu et al. (2018, p. 125)). This observation invites investigation along two fronts. First, to what extent is it the case that different households and population groups in India have participated to differing degrees in the generalized economic growth process? In other words, is there much relative income mobility, and has it increased over time? Second, are there particular distinguishing features of those population groups that have done particularly well, or alternatively that might have been poorly placed to see their fortunes improve? Pursuing such questions requires looking beyond

headline inequality measures to examine patterns of upward and downward relative mobility, and to construct profiles of the upwardly and downwardly mobile.

Our focus in this paper is to enquire into income mobility *within* generations (intragenerational mobility). Here one is asking whether long-term incomes are possibly distributed more equally than current incomes, and whether the process of inequality change reflects the experience of winners and losers (see further discussion in Jantti and Jenkins 2015).⁵ We ask whether there is much mobility across our survey years, and whether there has been an increasing tendency for households to see their relative positions in the consumption distribution change over the quarter-century since the late 1980s. We further explore whether we can identify population characteristics that are more commonly aligned with upward or downward movement in the consumption distribution, and whether there is evidence of change over time in the pertinence of those population characteristics.

As noted above, studies of intragenerational mobility at the all-India level have relied on IHDS panel data to describe mobility in terms of income. The IHDS survey was conducted in 2004/05 and again in 2011/12. It is a nationally representative survey with a sample size of just over 40,000 households, and it features a panel structure that allows one to track households across this interval. Moreover, the IHDS rural sample can also be linked to a sample surveyed in 1993 by the NCAER in their Human Development Profile of India (HDPI). Thus, there is scope for some assessment of mobility patterns between 1993/94 and 2004/05. Key issues that arise with respect to the analysis of mobility based on the IHDS (and HDPI) are, first, the analysis is based on income rather than consumption (even though most discussion about

⁵ Another direction is to study mobility across generations: asking questions about the extent to which children's living standards are associated with those of their parents, and often interpreting findings as offering a window on the extent of equality of opportunity in society (i.e. the extent to which children's fortunes are unrelated to the circumstances of their parents). The nationally representative data that allow an investigation of intergenerational income mobility are simply not available for India (although see van der Weide and Vigh (2018) for an analysis of intergenerational educational mobility in India).

distributional change in India has centred on consumption-based trends);⁶ second, the 1993/94 survey collects data on rural areas in India only, and thus its panel households with the 2004/05 survey are restricted to rural India and are not nationally representative.

Furthermore, the sample size of these surveys is large in absolute terms, but is not sufficient to allow an analysis of mobility at a finer, state-level disaggregation. The IHDS data are also prey to the standard concerns leveled at panel data regarding attrition (which is estimated to be around 20 percent) and the impact of measurement error. In short, it appears that these survey data do not enjoy the same official standing and recognition as the NSS surveys, at least in terms of household consumption and poverty consumption analysis.

Setting aside these concerns, emerging findings from the IHDS/HDPI-based analysis point to considerable churn within the income distribution, with both upward and downward mobility occurring alongside rising average income levels (Azam 2019; Ranganathan et al. 2017). Azam (2019) suggests that rural income mobility does not show a clear trend increase over time when one compares the 1993/94–2004/05 interval against the 2004/05–2011/12 interval. He goes on to show, however, that the characteristics of households experiencing upward mobility are different from those prone to downward shifts in relative position. Notably, households belonging to the disadvantaged Hindu castes (Other Backward Castes, as well as Scheduled Castes and Scheduled Tribes) are less likely to experience upward mobility than forward Hindu castes. By the same token, forward Hindu castes are less likely to experience downward mobility (Azam 2019). Muslim households display roughly similar mobility patterns as disadvantaged Hindu castes, but in urban areas (covering the period 2004/05–2011/12 only) they stand out as most likely to experience downward mobility. Azam (2019) goes on to show that mobility patterns across these population groups are attenuated, but do not disappear

⁶ The IHDS also collects consumption data. But compared with the NSS surveys, the IHDS has less than half the sample size and collects a much-reduced version of household consumption data (i.e. 47 consumption items in the latter, versus more than 400 items in the former).

altogether, when household characteristics such as education and location of residence are controlled for. Ranganathan et al. (2017) conduct a similar analysis with the IHDS data, but come to somewhat different conclusions from Azam (2019). Notably, they conclude that income mobility in rural areas is higher for the backward castes than for the forward castes (Ranganathan et al. 2017). The source of this disagreement is not entirely clear, but it could be related to differential treatment of data. For example, Ranganathan et al.’s study does not include split households in the analysis, leaving them with a total of just under 20,000 rural households in their analysis. This contrasts with Azam’s study, in which roughly 23,000 rural households were included in his balanced panel.

Seetahul (2018) examines occupational and earnings mobility in urban areas using the IHDS data. Her analysis shows that women enjoy less occupational mobility than men, but that the data reveal little systematic difference in patterns of earnings mobility across genders. With respect to caste and religious groups, the Hindu upper-caste group is found to be particularly well placed to transition out of casual wage employment into regular jobs, and to transition into increasingly skilled occupations. Scheduled Castes and Scheduled Tribes, in contrast, see little transition into such skilled occupations. Relative income mobility, proxied by rank changes in earnings, is found to be less pronounced among the upper-caste group—possibly as a result of their already generally occupying the upper percentiles of the earnings distribution in the initial period, thus being less able to further improve their ranking.⁷

Income mobility has also received attention in more focused microstudies in India. One such study by Himanshu et al. (2018) focuses on income mobility in the village of Palanpur in western Uttar Pradesh over a period of seven decades, extending from the late 1950s to 2015.

⁷ Some smaller panel surveys have been fielded for India, but none of these provides nationally representative data. For earlier studies that analyze these panel surveys, see e.g., Munshi and Rosenzweig (2009), Krishna and Shariff (2011), and Dercon et al. (2013) respectively for analyses of the Rural Economic and Demographic Survey panel between 1982 and 1999, the NCAER panel between 1993/94 and 2004/05, and the International Crops Research Institute for the Semi-Arid Tropics panel between 1975 and 2006.

They document the process of initial agricultural intensification and then economic diversification out of agriculture, which has been associated with rising per-capita incomes and declining poverty. In Palanpur, this process has also been associated with a rather sharp increase in inequality, particularly during the period of accelerating non-farm diversification in the 1980s and thereafter. Income mobility increased over time, and in Palanpur a striking observation has been the relative gains achieved in recent years by a particularly disadvantaged sub-caste in the village, offset to some extent by the relative decline of a sub-caste that historically concentrated on cultivation for its livelihood. Although the patterns of intragenerational mobility in Palanpur point to an evening out of lifetime income inequality compared with inequality estimates for a given year, Himanshu et al. (2018) also note that the observed rise in annual inequality seems to be accompanied by declining income mobility across generations. They find that the association between income levels of fathers and sons has become stronger across the two generations spanned by their data.

Finally, Dang and Lanjouw (2018) examine intragenerational poverty dynamics in India based on the NSS consumption surveys combined with a methodology to construct synthetic panels. The authors look at patterns of poverty mobility during the 2000s, examining the 2004/05, 2009/10, and 2011/12 NSS consumption surveys. Dang and Lanjouw (2018) indicate that there was considerable poverty mobility in India during the 2000s, and that this increased over time: their results point to faster poverty reduction and more transition out of poverty in the period 2009/10–2011/12 than in the period 2004/05–2009/10. Factors including more educational achievement, urban residence, wage work, and belonging to forward castes were positively associated with a relatively high likelihood of movements out of poverty and a relatively low likelihood of movements into poverty.

III. Analytical Framework

As noted above, the primary data sources that most commonly underpin distributional analysis in India are the NSS data collected by the National Sample Survey Organization. These are cross-sectional surveys that are regularly fielded over time, offering at best a snapshot of consumption-based welfare outcomes at specific moments of time. In this study we are interested in tracking consumption mobility and to pursue this question we convert the NSS surveys into synthetic panels. We implement an approach that has been recently introduced into the literature (Dang and Lanjouw, 2013; Dang, Lanjouw, Luoto and McKenzie, 2014) and provide a brief description below. We also briefly describe the approach followed to specify a vulnerability line, which allows us to then separate our population into our three categories of poor, vulnerable and secure.

III.1. Overview of Synthetic Panel and Vulnerability Analysis Methods

Let x_{ij} be a vector of household characteristics observed in survey round j ($j= 1$ or 2) that are also observed in the other survey round for household i , $i= 1, \dots, N$. These household characteristics include variables that may be collected in only one survey round, but whose values can be inferred for the other round. These variables may be roughly categorized in three types

- i) time-invariant variables such as ethnicity, religion, place of birth, or parental education,
- ii) deterministic variables such as age (which, given the value in one survey round, can then be determined given the time interval between the two survey rounds),⁸ and

⁸ To reduce spurious changes due to changes in household composition over time, we restrict the estimation samples to household heads age, say 25 to 55 in the first cross section and adjust this age range accordingly in the second cross section. This age range is usually used in traditional pseudo-panel analysis but can vary depending on the cultural and economic factors in each specific setting.

- iii) time-varying household characteristics if retrospective questions about the values of such characteristics in the first survey round are asked in the second round.

Let y_{ij} then represent household consumption or income in survey round j , $j= 1$ or 2 . The linear projection of household consumption (or income) on household characteristics for each survey round is given by

$$y_{ij} = \beta_j' x_{ij} + \varepsilon_{ij} \quad (1)$$

Let z_j be the poverty line in period j , $j= 1$ or 2 . We are interested in knowing such quantities as

$$P(y_{i1} < z_1 \text{ and } y_{i2} > z_2) \quad (2)$$

which represents the percentage of households that are poor in the first period but nonpoor in the second period (considered together for two periods), or

$$P(y_{i2} > z_2 | y_{i1} < z_1) \quad (3)$$

which represents the percentage of poor households in the first period that escape poverty in the second period. In other words, for the average household, quantity (2) provides the joint probabilities of household poverty status in both periods, and quantity (3) the conditional probabilities of household poverty status in the second period given their poverty status in the first period.

If true panel data are available, we can straightforwardly estimate the quantities in (2) and (3); but in the absence of such data, we can use synthetic panels to study mobility. To operationalize the framework we make two, fairly standard, assumptions. First, we assume that the underlying population being sampled in survey rounds 1 and 2 are identical such that their time-invariant characteristics remain the same over time. More specifically, this implies the conditional distribution of expenditure in a given period is identical whether it is conditional on the given household characteristics in period 1 or period 2 (i.e., $x_{i1} = x_{i2}$ implies $y_{i1}|x_{i1}$ and $y_{i1}|x_{i2}$ have identical distributions). Second, we assume that ε_{i1} and ε_{i2} have a bivariate normal

distribution with correlation coefficient ρ and standard deviations σ_{ϵ_1} and σ_{ϵ_2} respectively.⁹

Quantity (2) can be estimated by

$$P(y_{i1} < z_1 \text{ and } y_{i2} > z_2) = \Phi_2\left(\frac{z_1 - \beta_1' x_{i2}}{\sigma_{\epsilon_1}}, -\frac{z_2 - \beta_2' x_{i2}}{\sigma_{\epsilon_2}}, -\rho\right) \quad (4)$$

where $\Phi_2(\cdot)$ stands for the bivariate normal cumulative distribution function (cdf) (and $\phi_2(\cdot)$ stands for the bivariate normal probability density function (pdf)). In equality (4), the parameters β_j and σ_{ϵ_j} are obtained from equation (1), and ρ from the following formula

$$\rho = \frac{\rho_{y_1 y_2} \sqrt{\text{var}(y_1) \text{var}(y_2)} - \beta_1' \text{var}(x) \beta_2}{\sigma_{\epsilon_1} \sigma_{\epsilon_2}} \quad (5)$$

where the simple correlation coefficient $\rho_{y_1 y_2}$ is approximated from the birth-cohort-aggregated household consumption between the two surveys. Note that in equality (4), the estimated parameters obtained from data in both survey rounds are applied to data from the second survey round (x_2) (or the base year) for prediction, but we can use data from the first survey round as the base year as well. It is then straightforward to estimate quantity (3) by dividing quantity (2)

by $\Phi\left(\frac{z_1 - \beta_1' x_{i2}}{\sigma_{\epsilon_1}}\right)$, where $\Phi(\cdot)$ stands for the univariate normal cumulative distribution function (cdf).¹⁰

III.2. Setting Vulnerability Lines

Using the given poverty lines z_j , quantities (2) and (3) classify the population into two groups, one is poor and the other nonpoor. But we can obtain richer analysis by further

⁹ In other words, this assumption implies that households in period 2 that have similar characteristics to those of households in period 1 would have achieved the same consumption levels in period 1 or vice versa.

¹⁰ Further asymptotic results and formulae for the standard errors are provided in Dang and Lanjouw (2013). These studies also provide validation results for the synthetic panels against the actual panel data for several countries including Bosnia-Herzegovina, Lao PDR, Peru, the United States, and Vietnam. Other studies that offer further validation and extension include Cruces *et al.* (2015), Dang and Lanjouw (2017), Dang *et al.* (2019), and Bourguignon and Dang (2019).

disaggregating the nonpoor group into two groups: the vulnerable (those that are nonpoor but still face a significant risk of falling into poverty) and the secure (or “middle class”). A common, but rather ad-hoc, approach is to arbitrarily scale up the poverty line by a certain factor to obtain the vulnerability line. In India, vulnerability has in the past been proposed to occur within a fixed income range between 1.25 times and twice the national poverty line in India (NCEUS 2007). Other countries similarly define the vulnerability line as twice (Pakistan; Lopex-Calix et al, 2014) or 30% above (Vietnam; World Bank, 2012) the national poverty line. This approach has the advantage of being simple and easy to understand, but it appears to be based on no underlying welfare theoretical framework.

The recent approach proposed in Dang and Lanjouw (2017) instead derives the vulnerability line from a specified vulnerability index in the spirit of vulnerability to poverty. While sharing a similar conceptual approach and motivation with existing studies of vulnerability (e.g. Pritchett, Suryahadi, and Sumarto, 2000; Chaudhuri, 2003; Christiaensen and Subbarao, 2005), this approach differs from them in several important respects. First, it explicitly provides a framework to estimate a vulnerability line which is associated with a vulnerability index that can be derived in various ways, including budgetary planning, (ideal or desirable) social welfare objectives, or relative concepts of well-being. Second, unlike in Pritchett et al. (2000) and Chaudhuri (2003), the target population consists of the currently nonpoor households rather than all households. Finally, the Dang and Lanjouw (2017) approach employs simpler nonparametric estimation methods to estimate vulnerability as a function of consumption alone. It works with either actual panel data or synthetic panel data that can be constructed from cross-sections. We employ a vulnerability index of 20% and the associated vulnerability line for our welfare analysis in the next sections.

The dividing line v_j (vulnerability line), $j= 1$ or 2 , that separates these groups can be derived from the following equality

$$P = P(y_{i2} \leq z_2 | z_1 < y_{i1} < v_1) \quad (6)$$

In this study we specify the vulnerability index P to be 20% and we calculate the corresponding vulnerability line based on the 2004/5-2011/12 synthetic panel interval. This is associated with a vulnerability line of Rs. 770 in 2004/5 prices and can be compared to the all-India rural poverty line in 2004/5 of Rs.447. Note that P is bounded below by the percentage of the nonpoor population in period 1 falling into poverty in the second period. Note further that v_1 provides the solution to expression (6), which in turn can be used to obtain v_2 with an appropriate price deflator. Given v_j , we can extend expression (2) to analyze the dynamics for these three categories: poor, vulnerable, and secure. For example, the percentage of poor households in the first period that escape poverty but still remain vulnerable in the second period is¹¹

$$P(y_{i1} < z_1 \text{ and } z_2 < y_{i2} < v_2) = \Phi_2\left(\frac{z_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}, \frac{v_2 - \beta_2'x_{i2}}{\sigma_{\varepsilon_2}}, \rho\right) - \Phi_2\left(\frac{z_1 - \beta_1'x_{i2}}{\sigma_{\varepsilon_1}}, \frac{z_2 - \beta_2'x_{i2}}{\sigma_{\varepsilon_2}}, \rho\right) \quad (7)$$

IV. Validating the Synthetic Panel Method

As described above, the methodology we follow to produce synthetic panels with the NSS data is predicated on various assumptions. While these assumptions have been validated against actual panels in other contexts, they cannot all be readily tested empirically using cross-sectional data alone. Hence we attempt to gauge the likely reliability of our mobility estimates by validating the methodology with the IHDS data. Despite some limitations with the IHDS data themselves, our strategy here is to consider this data source as the benchmark to validate the synthetic panels.¹² To the extent that we find that the method appears to work well, we then

¹¹ See Dang and Lanjouw (2017) for further discussion, including another definition of the vulnerability line, as well their full derivations and properties.

¹² As noted above, the IHDS data have far fewer consumption items than the NSS, which can result in concerns about a less comprehensive consumption aggregate. Furthermore, the IHDS is also affected by an attrition rate of around 17 percent between 2004/05 and 2011/12 (IHDS 2015). Clearly, these issues may affect the validity of the IHDS as the benchmark data source for validation.

appeal to the common timing of the IHDS data with the NSS data for 2004/05 and 2011/12, and the representative sampling design of both data sources, to suggest that the method is also likely to work well for mobility comparisons based on the NSS rounds.

Our validation exercise works with the consumption measure that is available in the IHDS surveys. As noted above, most distributional analysis conducted with the IHDS surveys has been based on a per-capita income measure of well-being. The IHDS surveys are the only nationally representative surveys that contain such income information. The IHDS consumption data, in contrast, are highly abbreviated in comparison with consumption data from the NSS surveys, and are rarely used for distributional analysis as a result. However, for our purposes it is appealing to validate our synthetic panel methods using the IHDS consumption variable. This is because implementation of the procedure will then resemble more closely its subsequent application with the NSS data.

Since the IHDS surveys are panel surveys, we split the IHDS panels into two randomly drawn subsamples (each representing half of the total sample). Call these subsamples A and B. Then we can use subsample A in the first round and subsample B in the second round as two repeated cross-sections to which we apply our method. We can then compare the mobility results obtained from using subsample A to impute round 1 values for subsample B against the results we would get by using the genuine panel for subsample B. We use panels with the same household heads only for the genuine panels. As is common in pseudo-panel-based analysis, we restrict our attention to households whose head (in 2004/05) is in the 25–55-year age range.

It is useful to briefly note the estimation of ρ before discussing estimation results. As in Dang and Lanjouw (2018), we form cohorts by interacting household heads' age with a dummy variable indicating whether they belong to scheduled castes. The partial correlation coefficient ρ is estimated to be 0.39 and strongly statistically different from zero. This value is not

identical, but close, to the corresponding value of 0.29 for ρ based on the actual panel.¹³ We will return in the next section to more discussion on estimation results using this value of ρ from the IHDS panel.

Table 1 compares point estimates of IHDS consumption dynamics in the IHDS true panel and the synthetic. We use data from the 2011/12 second survey round (x_{i2}) as the base year for predictions. See the Appendix for detailed estimation results. We calculate the bootstrap standard errors by bootstrapping (y_{ij} , x_{ij}) from its empirical distribution function (1,000 times), adjusting for the complex survey design of the IHDS (including stratification, cluster sample, and population weights), and applying the estimated parameters for equation [1] from the original samples.

We provide two ways to evaluate the goodness-of-fit for estimation results. First, we consider the precision of the synthetic panel point estimates by enumerating the number of times they fall within the 95 percent confidence interval (CI) around those from the actual panels. A more demanding test is to consider similar statistics on a narrower band of one standard error around the actual panel estimates. Table 1 reveals that of the 15 possible cells, the synthetic panel method produces estimates that fall within the 95 percent CI of the true panel estimates in 10 cases (and in half of those, the estimates fall within one standard error). Even in those cases where the estimates fall outside the 95 percent CI, scrutiny of the estimates reveals that they are actually quite close. For example, while 21 percent of the population in the actual panel was estimated to be vulnerable in both 2004/05 and 2011/12, the corresponding estimate in the synthetic panel was 19.3 percent.¹⁴ Similarly 18.6 percent of the population in

¹³ Monte Carlo simulations provided in Dang and Lanjouw (2013) suggest that estimates on poverty dynamics based on synthetic panels remain rather robust even where ρ changes its values over a range of up to 40 percent. The estimated values of ρ for the periods 1987/88-1993/94, 1993/94-2004/05, and 2004/05-2011/12 using the NSS data are respectively 0.74, 0.57, and 0.57.

¹⁴ In Table 1 we apply a vulnerability line that is twice the poverty line of INR 486. As our focus was on probing the validity of the synthetic panel method, we chose not to also apply the method for estimating a vulnerability

the actual panel comprised those who had been poor in 2004/05 but were non-poor but vulnerable in 2011/12. This compares with an estimate of 16.7 percent in the synthetic panel. Overall, the impression one is left with is that the synthetic panels do a reasonably good job of reproducing the true panel estimates. Certainly, broad-brush qualitative conclusions derived from the synthetic panels would seem to be rather robust. Based on these reasonably encouraging results, we report below our synthetic panel-based estimates of consumption dynamics over the 1987–2012 period derived from NSS data.

V. Welfare Dynamics Analysis

V.1. Mobility Levels and Trends

We begin by enquiring into the extent of consumption mobility and assessing how this has evolved over time. Table 2 reports consumption dynamics across our three population groups between the 1987/88 and 1993/94 survey years. During this interval, overall poverty remained largely unchanged at roughly 46 percent of the population.¹⁵ We employ two different approaches to setting the vulnerability line. The first refers to an arbitrarily set vulnerability line equal to twice the national poverty line. In panel B we reproduce our estimates, based now on a vulnerability line associated with an average risk of falling into poverty by the vulnerable of no less than 20 percent. The two panels differ primarily in that panel A is associated with a somewhat higher vulnerability line, corresponding to a larger share of the population found in the vulnerable group.

In both panels, a majority of the population can be found in the cells along the diagonal of the transition matrix, indicating that they were either poor, vulnerable, or secure in both years.

line from the data as described in Section 3. Mobility patterns associated with our estimated poverty line are examined when we turn to our description of mobility patterns based on the NSS-based synthetic panels.

¹⁵ Recall that our reference population comprises only that population that belonged to households in which the head was aged between 25 and 55 years in the base year. Overall poverty estimates may therefore differ somewhat from conventionally reported rates for the total population. The underlying regressions are provided in Table A.1 in Appendix A.

Roughly 70 percent of the population recorded no movement during this interval, and so we are seeing about 30 percent of the population experiencing some consumption mobility over this period.¹⁶ Of those that moved, only a very small percentage of the population was associated with jumps of more than one cell. For example, panel A indicates only 0.1 percent of the population was secure in 1993/94 having been poor in 1987/88, and only 0.2 percent of the population was poor in 1993/94 having been secure in 1987/88.

An additional statistic readily derived from Table 2 is the estimate of mobility conditional on initial position. Thus we can see in panel A that about 77 percent of the poor in 1987/88 (= 35.9/46.4) remained poor in 1993/94, and 67 percent of the vulnerable remained vulnerable over this time period. Interestingly, nearly half (43 percent) of the secure transitioned downward into the vulnerable group between 1987/88 and 1993/94. Overall, our comparison of welfare transitions in the synthetic panel for 1987/88 and 1993/94 indicates a fair amount of stability across the classes that we have defined; only about a third of the population registers a move across classes.

In the years following 1993/94, the poverty decline started to accelerate, and welfare transitions also increased. Table 3 shows that alongside a modest five-percentage-point decline in poverty between 1993/94 and 2004/05 (from about 45 percent to 40 percent), about 60–61 percent of the population remained on the diagonal of the transition matrix (in panels A and B respectively), indicating that mobility rose to about 40 percent of the population. Of course, the interval in this case is somewhat longer than was considered in Table 2, and one might expect more mobility over longer periods. However, the rising average consumption levels occurring over this time period would suggest a priori an increased likelihood of the population

¹⁶ In this paper we refrain from calculating a full battery of summary measures of mobility, as we are already working with predicted welfare transitions and are cognizant of the imprecision and underlying assumptions that they are associated with. We therefore choose to focus our discussion on the basic patterns we observe in our transition matrices. See Jantti and Jenkins (2015) and Fields (2008) for detailed discussions of mobility measurement and interpretation.

crossing the fixed standard of living captured by an absolute poverty line (and its associated vulnerability lines). Hence the rise in mobility captured in this way is likely real.

Alongside the rise in unconditional mobility, Table 3 also reveals that there was an increase in conditional mobility. Just under two-thirds of the poor in 1993/94 remained poor in 2004/05 (compared with three-quarters in the preceding interval), and 51–61 percent of the vulnerable (in panels B and A respectively) remained vulnerable (down from 64 percent). Downward mobility among the secure also declined, from about 45 percent in the 1987/88–1993/94 interval to less than a third in 1993/94–2004/05.

If we consider the 2004/05–2011/12 interval—a somewhat shorter period—we can see in Table 4 that mobility increased further. Alongside a striking reduction in poverty, from 35.5 percent to 24.8 percent, consumption mobility rose, with off-diagonal entries in panels A and B now representing 43–46 percent of the population. More than half of the poor in 2004/05 (about 54 percent) were no longer poor in 2011/12. Interestingly, however, although (conditional) mobility by the poor into the category of the secure did increase compared with the earlier intervals, it remained a rather rare event: only about 5 to 10 percent of the poor were able to make this transition across two welfare classes between 2004/05 and 2010/11. The picture of poverty decline emerging from this assessment is that although the poor did see improvements in living standards during the 2000s, they generally continued to face a heightened risk of falling back into poverty.¹⁷

¹⁷ As discussed earlier, the IHDS panel does not provide the perfect benchmark panel data to compare with the NSS given its much less detailed consumption aggregate and considerable attrition rate. Still, it could be useful to qualitatively gauge the mobility patterns if we are to employ the value of ρ that is estimated from the IHDS panel, but treating it as repeated cross sections. Table A.2 in Appendix A replicates the estimates for Table 4 above, using the estimated ρ value of 0.39 based on the IHDS. Estimation results remain qualitatively similar. Off-diagonal entries in panels A and B represent 42–49 percent of the population, and more than half of the poor in 2004/05 (about 58 percent) were no longer poor in 2011/12. These estimates provide supportive evidence for the estimation results offered in Table 4.

Tables 5 and 6 consider consumption mobility over the longer intervals of 1993/94–2011/12 and 1987/88–2011/12, in an effort to enquire into longer-term welfare transitions.¹⁸ A striking observation from these tables is that although poverty declined markedly over this entire period, a very significant percentage did not experience mobility out of poverty. About 43 percent of the poor in 1993/94 were still poor in 2011/12 (Table 5, panels A and B). Reading down the first column of Table 5 reveals that of the 25.5 percent of the population that was poor in 2011/12, a remarkable three-quarters (76 percent) had been poor in 1993/94. The corresponding figures for the 1987/88–2011/12 interval in Table 6 are very similar.

Thus, while mobility has risen in India, with growing numbers of the poor transitioning upwards into the category of the vulnerable (and some even graduating to secure status), those who are poor in 2011/12 are largely comprised of the long-term or chronically poor. This picture accords with a narrative of poverty decline accompanying accelerating economic growth in India, but with the poor increasingly comprising the structural long-term poor, who have been non-participants in the growth process. It is important to note that this picture is far from inevitable: one could also have imagined a growth process involving a great deal of churn, in which households escaped and fell back into their respective consumption classes, and where the poor in any one year were largely comprised of previously vulnerable and secure households. A potential concern emerging from the patterns we observe is that further poverty reduction will become increasingly difficult to achieve through a general growth process that fails to address the structural factors that prevent the chronically poor from escaping poverty.

Before concluding this subsection, we revisit briefly the finding, already noted by Dang and Lanjouw (2018), of mobility changes within the 2004/05–2011/12 interval. Tables A.3 and

¹⁸ Synthetic panels constructed over longer intervals are generally more tentative, as time-invariant regressors in the prediction models are less readily available, and the models accordingly have less explanatory power. Cruces et al. (2015) indicate, however, that they may not perform too badly; in their validation of the synthetic panel method with long-term panel data from Chile, they find that welfare transition estimates remain quite accurate.

A.4 in the Appendix compare mobility patterns between 2004/05–2009/10 and 2009/10–2011/12. Dang and Lanjouw (2017) noted that notwithstanding the shorter duration of the latter interval, mobility across the consumption categories was higher in the 2009/10–2011/12 interval than in the preceding interval. This finding is confirmed in these tables, which show that the percentage of the population off the diagonal of the transition matrices increased from below 37 percent between 2004/05 and 2009/10 to nearly 42 percent between 2009/10 and 2011/12 (comparing panels A in Tables A.3 and A.4—results are similar for panels B).¹⁹ During the latter episode, the percentage of the poor that transitioned into the secure category increased to 4 percent (up from 2 percent in 2004/05–2009/10), and similarly the percentage of the vulnerable who were able to transition to secure status rose from 18 percent to 23 percent.

V.2. Mobility across Quintiles

Our discussion of mobility so far has focused on transitions across the three per-capita consumption categories that we defined: poor, vulnerable, and secure. These categories are expressed in absolute terms, based on the national poverty line and a vulnerability line that is expressed as either twice the national poverty line or, alternatively, as the income level below which the non-poor in 2004/05 face an average risk of falling back into poverty by 2011/12 of no less than 20 percent. It is clear that with rising incomes on average, there will likely be movements across these categories even if there are no changes in the ranking of individuals within the consumption distribution. To focus on pure relative mobility, we consider in Table 7 transitions across quintiles of the per-capita consumption distribution between 1987/88 and 2011/12.²⁰ We have seen from our discussion above that even when our discussion of mobility

¹⁹ Note that we use a different vulnerability line from that in Dang and Lanjouw (2017), which further supports the robustness of these results.

²⁰ We note that efforts to validate transition estimates across quintiles with the IHDS proved less successful than our estimates across the three consumption categories, which we defined in absolute terms. It remains unclear to what extent this result is caused by data concerns, as discussed earlier. But given these weaker results, we do not

accommodates not just relative movement but also movement driven by absolute increases in consumption, slightly more than half of the population registered a transition across consumption categories between 1987/88 and 2011/12. In Table 6, about 51–55 percent of the population occupy an off-diagonal position in panels A and B. Thus mobility, while present, is far from complete.

In Table 7 we see that this assessment of limited mobility also prevails when we consider purely relative mobility, allowing only for rank changes. Around 40 percent of the population is observed to have remained in the same quintile over this 25-year period. To put it differently, 60 percent of the population experienced a change in their quintile position in this period. Notably, mobility among the bottom and top quintiles was particularly low—more than half of the bottom quintile in 1987/88 remained in the bottom quintile in 2011/12, and similarly for the richest quintile. In the middle three quintiles, transitions across quintiles were commoner, although most transitions were to an adjacent quintile rather than to a more distant one. Thus, while only about 25 percent (4/16.6) of the second quintile remained in the second quintile between 1987/88 and 2011/12, the vast majority (80 percent) were found in quintiles 1–3 in 2011/12.

V.3. Mobility Profiles

We turn next to an examination of the population characteristics associated with upward and downward mobility. We ask as well how these have changed over time. We focus our attention on two intervals of roughly similar duration (five to six years): 1987/88–1993/94 and 2004/05–2011/12. As was seen above, these two intervals are clearly distinguishable in that the former interval was marked by modest rates of economic growth and little overall reduction

focus on the quintile transition in this paper. For further validation results with quintile matrices, we refer interested readers to the discussion in Dang and Lanjouw (2013).

in poverty, while the latter was associated with rapid per-capita income growth and a dramatic fall in poverty. We ask whether these two very different economic settings were associated with different profiles of the mobile.

Figure 2 examines cases of upward mobility, and considers the population shares of different groups that moved up one or two consumption categories. We consider groups defined in terms of the reported schooling completion level of the household head, sector and occupation category of the household head, and social group composition of the household (Scheduled Tribe, Scheduled Caste, or Other). On average, between 1987/88 and 1993/94, 22.7 percent of the population moved up one or two consumption categories. This compares with a rate of 45.7 percent of the population between 2004/05 and 2011/12. The general profiles of the upwardly mobile remained rather similar across these two intervals: upward mobility was more likely than average among those with middle schooling or higher levels of education, and among those residing in urban areas and engaged in self-employment and wage-earning activities. The uneducated, the rural, and Scheduled Tribes and Scheduled Castes were markedly less likely to experience upward mobility. Across the two intervals, there is a suggestion that the advantage conferred by secondary schooling and, more strongly, college education in terms of upward mobility has attenuated somewhat over time. This is perhaps not surprising given the general expansion of education in India over this quarter-century. The disadvantage conferred by Scheduled Caste status appears also to have diminished over time, although not to the extent that it has disappeared. Overall, there seems to be clear advantage to residing in urban areas and a pronounced disadvantage to belonging to the Scheduled Tribes.

Considering next downward mobility, we essentially see a mirror image in Figure 3 compared with Figure 2. The poorly educated, the rural, and the disadvantaged social groups are considerably more likely to fall back one or two consumption categories in both the

1987/88–1993/94 and 2004/05–2011/12 intervals. Over time, there is again a suggestion of some attenuation in the degree to which these characteristics confer a disadvantage.

V.4. Mobility across States

A question then naturally arises: do the different states exhibit the same mobility patterns as seen at the all-India level? To study this question, we examine each state's performance relative to the national averages in the two periods 1987/88–1993/94 and 2004/05–2011/12. Since some states split (or merged) over time, we only show in Figures 4 and 5 upward and downward mobility patterns for the 16 larger states that remained the same over these periods. For better comparison, we show the states' performance relative to the all-India level. Full estimation results for these states are provided in Table A.5 in the Appendix.

Several remarks are in order. First, Figure 4 shows that states that perform worse than the national average in terms of upward mobility in the first period tend to display a similar performance in the second period. Indeed, in both periods three-fourths (i.e. 12 out of 16) of these larger states have worse-than-average performance. For example, several states (Orissa, Madhya Pradesh, West Bengal, and Rajasthan) consistently perform worse in both periods. But there are some exceptions, with states improving at different rates. For example, four states jump from being worse than the national average in the first period to being better than the national average in the second period (Delhi, Punjab, Tamil Nadu, and Maharashtra). Second, some states stand out with their change over time. For example, Delhi turns into the best performer in the second period despite being among the worst performers in the first period.

Finally, Figure 5 indicates a somewhat opposite pattern with downward mobility for these larger states. The majority of these larger states (i.e., 12 out of 16 states) have less downward mobility relative to the national average in the first period, but more relative downward mobility in the second period. Two states (Bihar and Himachal Pradesh) have more relative mobility in both periods. But some star performer stand out, such as Delhi, which changes from

having more downward mobility than the national average in the first period to having less downward mobility in the second period. Other states (Punjab, Maharashtra, and Tamil Nadu) may not achieve this impressive turnaround but also manage to significantly reduce their mobility over time.

It can be useful to compare mobility profiles for some states with different performances. We pick two states at the two ends of the range of performance, Orissa and Delhi, which respectively have below-average performance in terms of upward mobility and achieve much improvement in the two periods under consideration (Figure 4). We provide estimation results for upward mobility and downward mobility for these two states in Figures 6 and 7. Both states mostly show qualitatively similar patterns to the national trends. For example, there is a similar pattern of attenuation for downward mobility (Figure 7) for the poorly educated, the rural, and the disadvantaged social groups. But more interestingly, certain nuanced differences exist between them. In particular, having some college education is more strongly correlated with more upward mobility (Figure 6) and less downward mobility (Figure 7) for Delhi than Orissa. Furthermore, this correlation also becomes much stronger over time for Delhi, which points to education as an important factor in raising upward mobility. This pattern is qualitatively similar when we compare a pair of two other states that are closer to the middle range of the performance, Bihar and Punjab (Figures A.1 and A.2 in the Appendix).

VI. Conclusion

We analyze welfare dynamics in the past 25 years using five “thick” rounds of the NSS survey data between 1987/8 and 2011/12. In the absence of actual panel data, we construct synthetic panels that allow us to investigate dynamic patterns. We find increasing general mobility as well as upward mobility over time for the country. Yet, a majority of the poor who have escaped poverty remain vulnerable. Our estimation results suggest that higher education levels, and self-employment and wage-earning activities, particularly for urban residents, are

characteristics that are strongly associated with upward mobility. On the other hand, those with less education, rural residence, as well as belonging to Scheduled Tribes and Scheduled Castes are markedly more likely to experience downward mobility. We also find that states exhibit heterogenous mobility patterns.

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Table 1: Validation against the IHDS, India 2004/05-2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line, IHDS actual panels		2011			
		Poor	Vulnerable	Secure	Total
2004	Poor	12.7 (0.5)	18.6 (0.5)	6.1 (0.3)	37.4 (0.8)
	Vulnerable	6.9 (0.4)	21.0 (0.5)	15.1 (0.5)	43.0 (0.7)
	Secure	1.2 (0.1)	6.2 (0.3)	12.1 (0.4)	19.6 (0.6)
	Total	20.8 (0.7)	45.8 (0.7)	33.4 (0.7)	100
Panel B: Vulnerability line equals twice poverty line, IHDS synthetic panels		2011			
		Poor	Vulnerable	Secure	Total
2004	Poor	15.1 (0.2)	16.7 (0.2)	5.9* (0.1)	37.7* (0.4)
	Vulnerable	7.1* (0.1)	19.3 (0.1)	15.9 (0.1)	42.3 (0.2)
	Secure	1.1 (0.0)	6.1* (0.1)	12.9 (0.2)	20.0* (0.3)
	Total	23.3 (0.3)	42.1 (0.1)	34.6 (0.3)	100

Note: Bold font indicates the estimate falls within the 95% CI of the actual estimate; a start ("*") indicates the estimate falls within one standard error of the actual estimate. Standard errors in parentheses are estimated with 1000 bootstraps for the synthetic panels, and with adjustment for the complex survey design for both the actual and synthetic panels.

Table 2: Welfare Transition Dynamics Based on Synthetic Panel Data, India 1987/88-1993/94 (percentage)

Panel A: Vulnerability line equals twice poverty line		1993			
		Poor	Vulnerable	Secure	Total
1987	Poor	35.9 (0.1)	10.4 (0.0)	0.1 (0.0)	46.4 (0.1)
	Vulnerable	10.4 (0.0)	28.0 (0.0)	3.6 (0.0)	42.1 (0.0)
	Secure	0.2 (0.0)	4.9 (0.0)	6.4 (0.1)	11.5 (0.1)
	Total	46.5 (0.1)	43.4 (0.0)	10.2 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		1993			
		Poor	Vulnerable	Secure	Total
1987	Poor	35.9 (0.1)	10.1 (0.0)	0.4 (0.0)	46.4 (0.1)
	Vulnerable	10.1 (0.0)	21.0 (0.0)	5.0 (0.0)	36.1 (0.0)
	Secure	0.5 (0.0)	6.3 (0.0)	10.7 (0.1)	17.6 (0.1)
	Total	46.5 (0.1)	37.4 (0.0)	16.1 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 95,391 and 79,793 for the first and second period respectively.

Table 3: Welfare Transition Dynamics Based on Synthetic Panel Data, India 1993/94-2004/05 (percentage)

Panel A: Vulnerability line equals twice poverty line		2004			
		Poor	Vulnerable	Secure	Total
1993	Poor	29.4 (0.1)	14.8 (0.0)	0.7 (0.0)	44.9 (0.1)
	Vulnerable	10.5 (0.0)	26.7 (0.0)	6.6 (0.0)	43.8 (0.0)
	Secure	0.3 (0.0)	4.3 (0.0)	6.7 (0.1)	11.3 (0.1)
	Total	40.2 (0.1)	45.8 (0.0)	14.0 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2004			
		Poor	Vulnerable	Secure	Total
1993	Poor	29.4 (0.1)	13.8 (0.0)	1.7 (0.0)	44.9 (0.1)
	Vulnerable	9.9 (0.0)	19.5 (0.0)	8.2 (0.0)	37.6 (0.0)
	Secure	0.8 (0.0)	5.6 (0.0)	11.0 (0.1)	17.4 (0.1)
	Total	40.2 (0.1)	38.9 (0.0)	20.9 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 85,385 and 83,301 for the first and second period respectively.

Table 4: Welfare Transition Dynamics Based on Synthetic Panel Data, India 2004/05-2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line		2011			
		Poor	Vulnerable	Secure	Total
2004	Poor	17.8 (0.0)	16.9 (0.0)	1.8 (0.0)	36.5 (0.1)
	Vulnerable	6.8 (0.0)	28.4 (0.0)	12.9 (0.0)	48.1 (0.0)
	Secure	0.2 (0.0)	4.6 (0.0)	10.6 (0.1)	15.4 (0.1)
	Total	24.8 (0.0)	49.9 (0.0)	25.3 (0.1)	100
			(0.0)	(0.0)	(0.1)
Panel B: Vulnerability line corresponding to V-index= 0.2		2011			
		Poor	Vulnerable	Secure	Total
2004	Poor	17.8 (0.0)	15.1 (0.0)	3.6 (0.0)	36.5 (0.1)
	Vulnerable	6.4 (0.0)	19.4 (0.0)	14.6 (0.0)	40.4 (0.0)
	Secure	0.6 (0.0)	5.6 (0.0)	17.0 (0.1)	23.1 (0.1)
	Total	24.8 (0.0)	40.1 (0.0)	35.1 (0.1)	100
			(0.0)	(0.0)	(0.1)

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 91,751 and 75,159 for the first and second period respectively.

Table 5: Welfare Transition Dynamics Based on Synthetic Panel Data, India 1993/94-2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line		2011			
		Poor	Vulnerable	Secure	Total
1993	Poor	19.3 (0.1)	22.1 (0.0)	3.5 (0.0)	44.9 (0.1)
	Vulnerable	6.0 (0.0)	24.3 (0.0)	13.6 (0.0)	43.8 (0.0)
	Secure	0.2 (0.0)	3.0 (0.0)	8.0 (0.1)	11.3 (0.1)
	Total	25.5 (0.1)	49.4 (0.0)	25.1 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2011			
		Poor	Vulnerable	Secure	Total
1993	Poor	19.3 (0.1)	19.2 (0.0)	6.4 (0.0)	44.9 (0.1)
	Vulnerable	5.6 (0.0)	16.7 (0.0)	15.3 (0.0)	37.6 (0.0)
	Secure	0.5 (0.0)	3.8 (0.0)	13.1 (0.1)	17.4 (0.1)
	Total	25.5 (0.1)	39.8 (0.0)	34.7 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 85,385 and 55,757 for the first and second period respectively.

Table 6: Welfare Transition Dynamics Based on Synthetic Panel Data, India 1987/88-2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line		2011			
		Poor	Vulnerable	Secure	Total
1987	Poor	18.4 (0.1)	23.0 (0.0)	4.9 (0.0)	46.4 (0.1)
	Vulnerable	6.0 (0.0)	22.4 (0.0)	13.7 (0.0)	42.1 (0.0)
	Secure	0.3 (0.0)	3.5 (0.0)	7.7 (0.1)	11.5 (0.1)
	Total	24.7 (0.1)	48.9 (0.0)	26.3 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2011			
		Poor	Vulnerable	Secure	Total
1987	Poor	18.4 (0.1)	19.7 (0.0)	8.2 (0.0)	46.4 (0.1)
	Vulnerable	5.6 (0.0)	15.3 (0.0)	15.2 (0.0)	36.1 (0.0)
	Secure	0.7 (0.0)	4.2 (0.0)	12.6 (0.1)	17.6 (0.1)
	Total	24.7 (0.1)	39.2 (0.0)	36.1 (0.1)	100

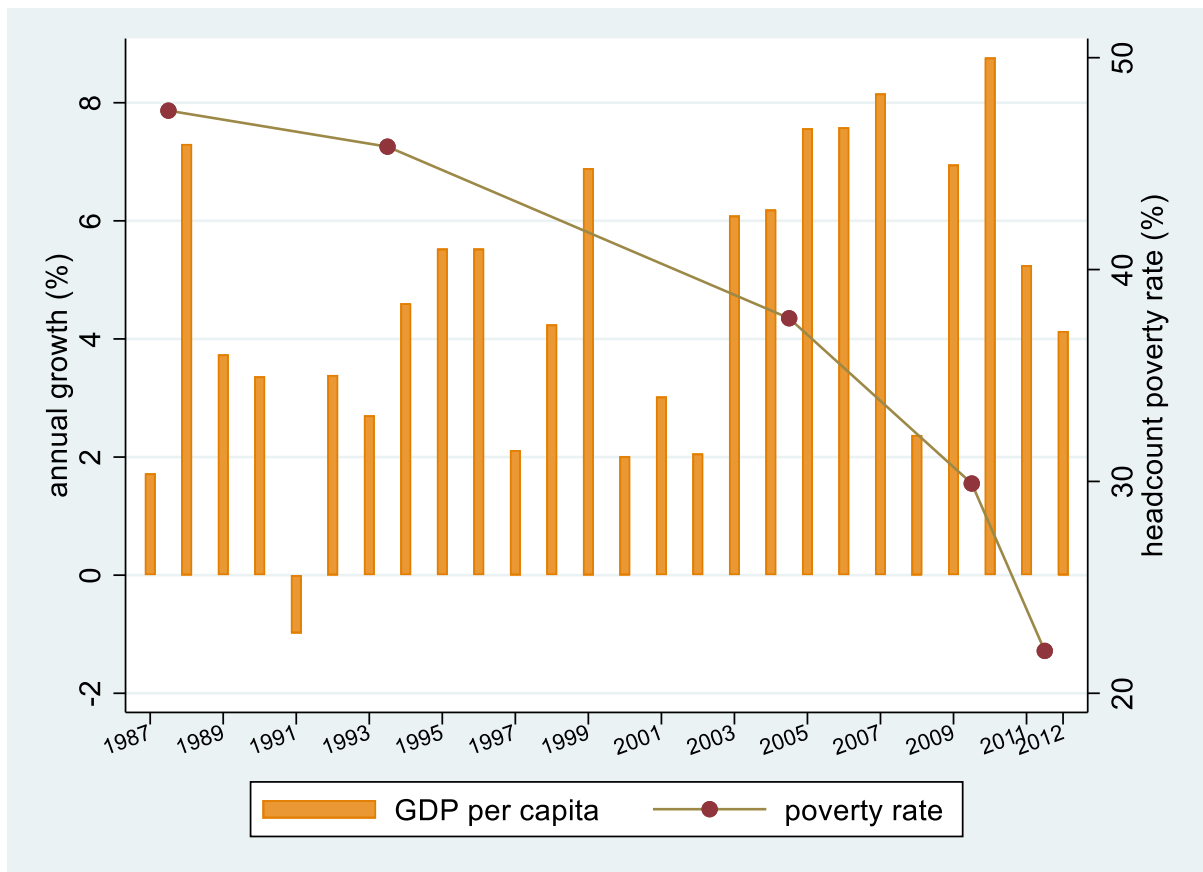
Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 85,385 and 55,757 for the first and second period respectively.

Table 7: Welfare Transition Dynamics Based on Synthetic Panel Data, India 1987/88-2011/12 (percentage)

		2011					
		Poorest	Quintile 2	Quintile 3	Quintile 4	Richest	Total
1987	Poorest	12.4 (0.1)	4.4 (0.0)	2.8 (0.0)	1.4 (0.0)	0.3 (0.0)	21.4 (0.1)
	Quintile 2	5.4 (0.0)	4.0 (0.0)	3.7 (0.0)	2.6 (0.0)	0.8 (0.0)	16.6 (0.0)
	Quintile 3	3.6 (0.0)	3.9 (0.0)	4.6 (0.0)	4.4 (0.0)	1.9 (0.0)	18.5 (0.0)
	Quintile 4	2.0 (0.0)	3.2 (0.0)	5.0 (0.0)	6.7 (0.0)	4.8 (0.0)	21.7 (0.0)
	Richest	0.4 (0.0)	1.1 (0.0)	2.7 (0.0)	5.8 (0.0)	11.8 (0.1)	21.8 (0.1)
	Total	23.8 (0.1)	16.8 (0.0)	18.9 (0.0)	20.9 (0.0)	19.6 (0.1)	100

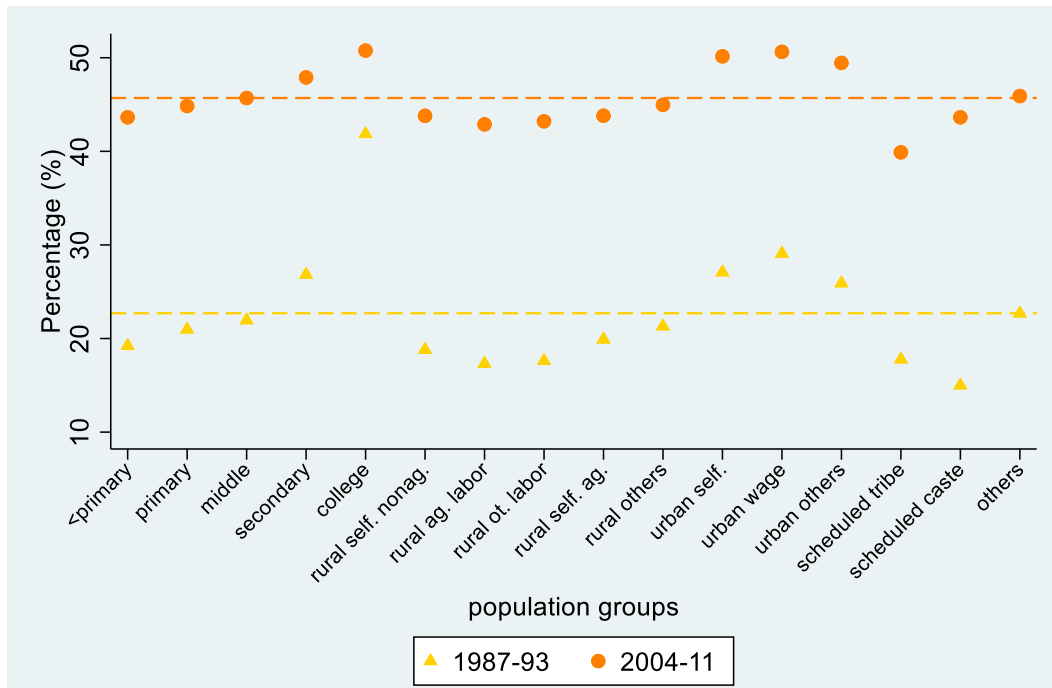
Note: All numbers are in 2004 price for all rural India. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 85,385 and 55,757 for the first and second period respectively.

Figure 1: Trends in Poverty and GDP per capita for India, 1987/88- 2011/12



Source: authors' illustration based on data from NSS and World Development Indicators.

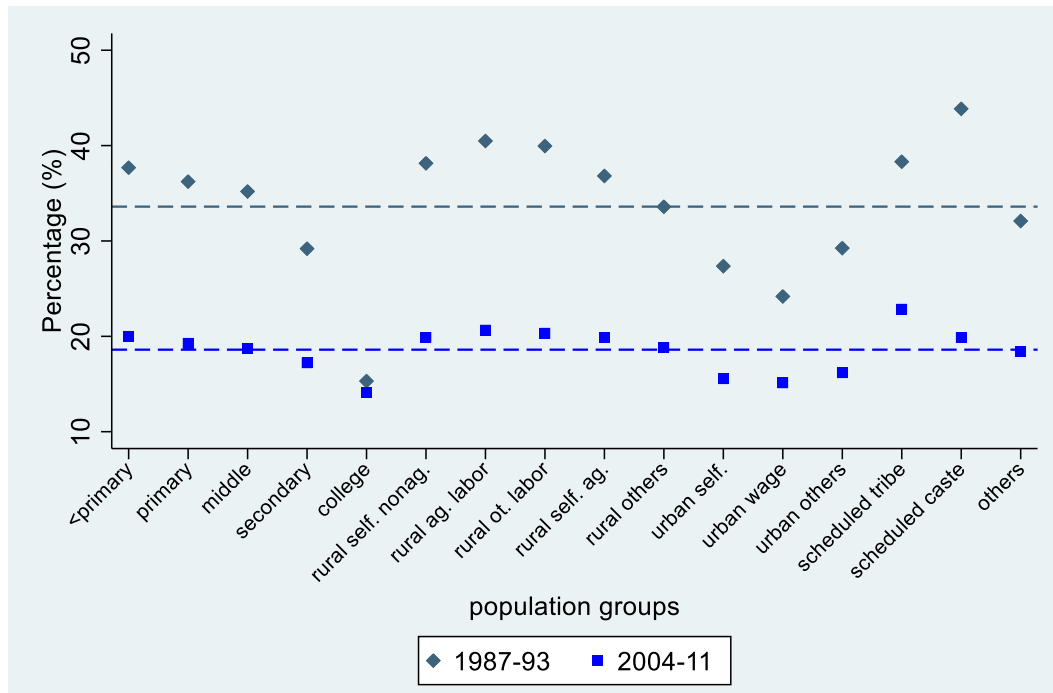
Figure 2: Profiling of the Population that Moved up One or Two Consumption Categories, India 1987/88- 2011/12



Note: Dashed lines represent the national average for each period (i.e. 22.7 per cent for 1987–93 and 45.7 per cent for 2004–11).

Source: authors' calculations based on NSS data.

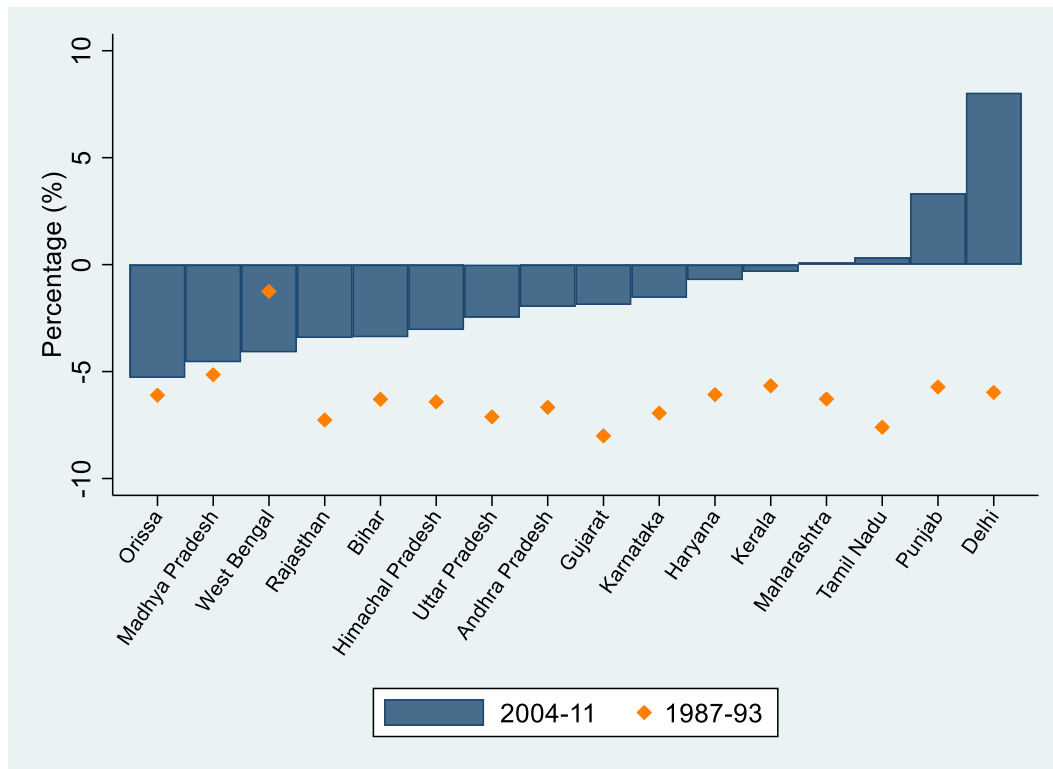
Figure 3: Profiling of the Population that Moved down One or Two Consumption Categories, India 1987/88- 2011/12



Note: Dashed lines represent the national average for each period (i.e. 33.6 per cent for 1987–93 and 18.6 per cent for 2004–11).

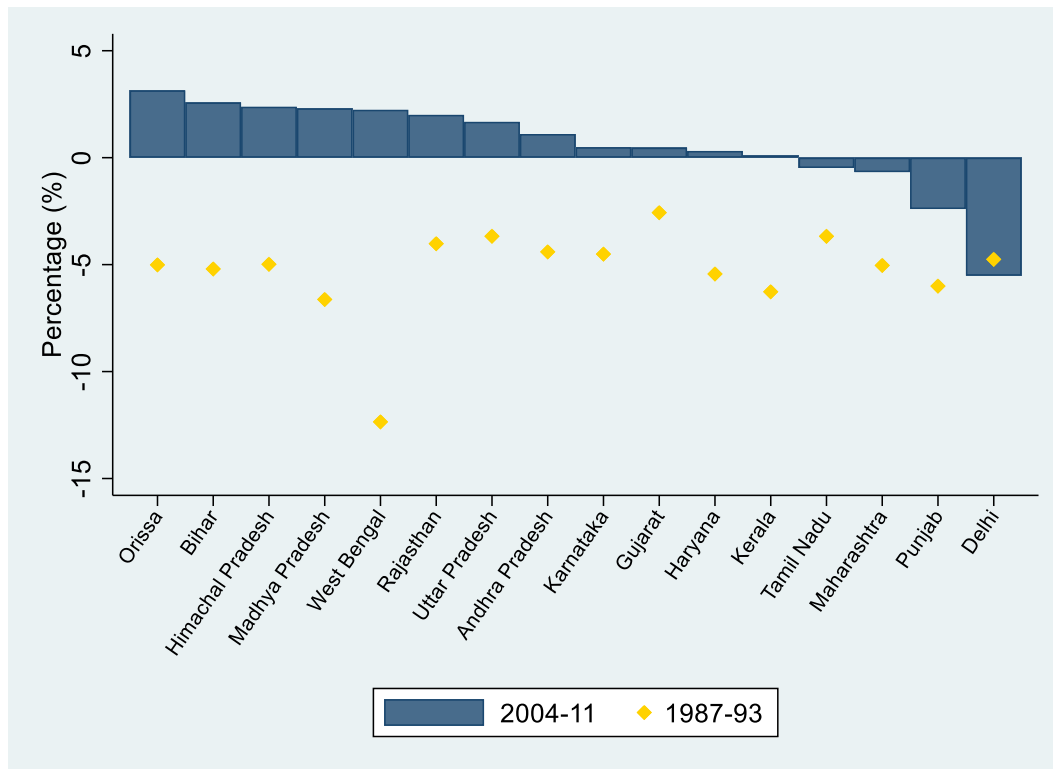
Source: authors' calculations based on NSS data.

Figure 4: Profiling of the Population that Moved up One or Two Consumption Categories by State Relative to the National Average, India 1987/88- 2011/12



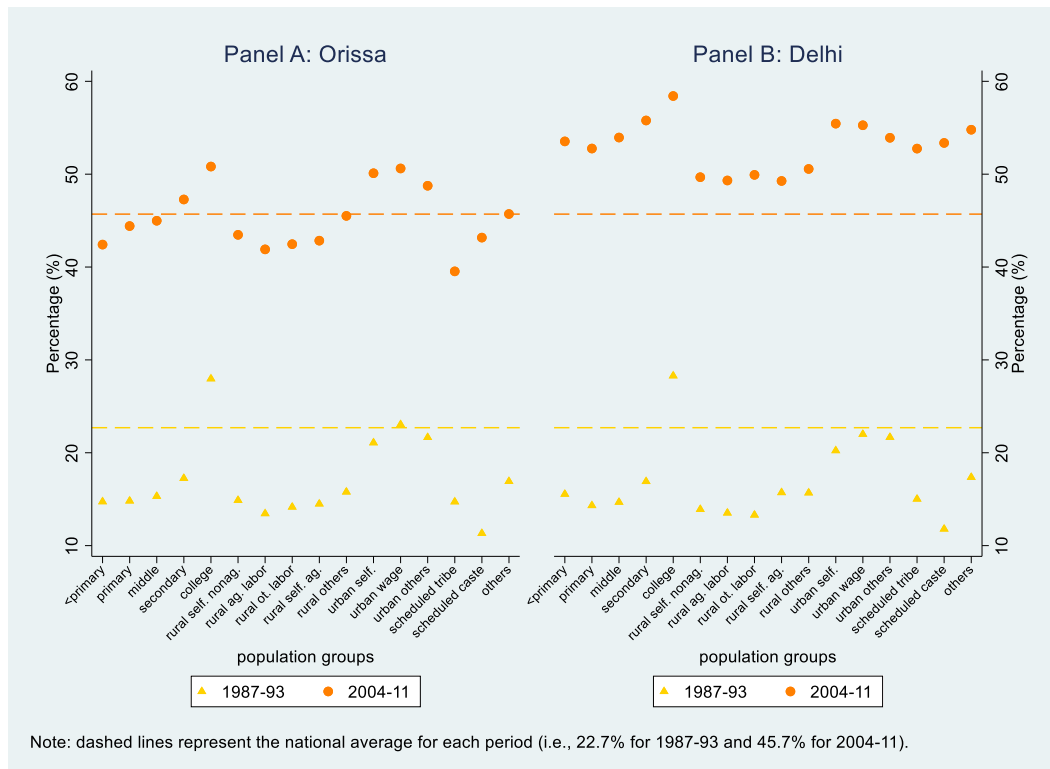
Source: authors' calculations based on NSS data.

Figure 5: Profiling of the Population that Moved down One or Two Consumption Categories by State Relative to the National Average, India 1987/88- 2011/12



Source: authors' calculations based on NSS data.

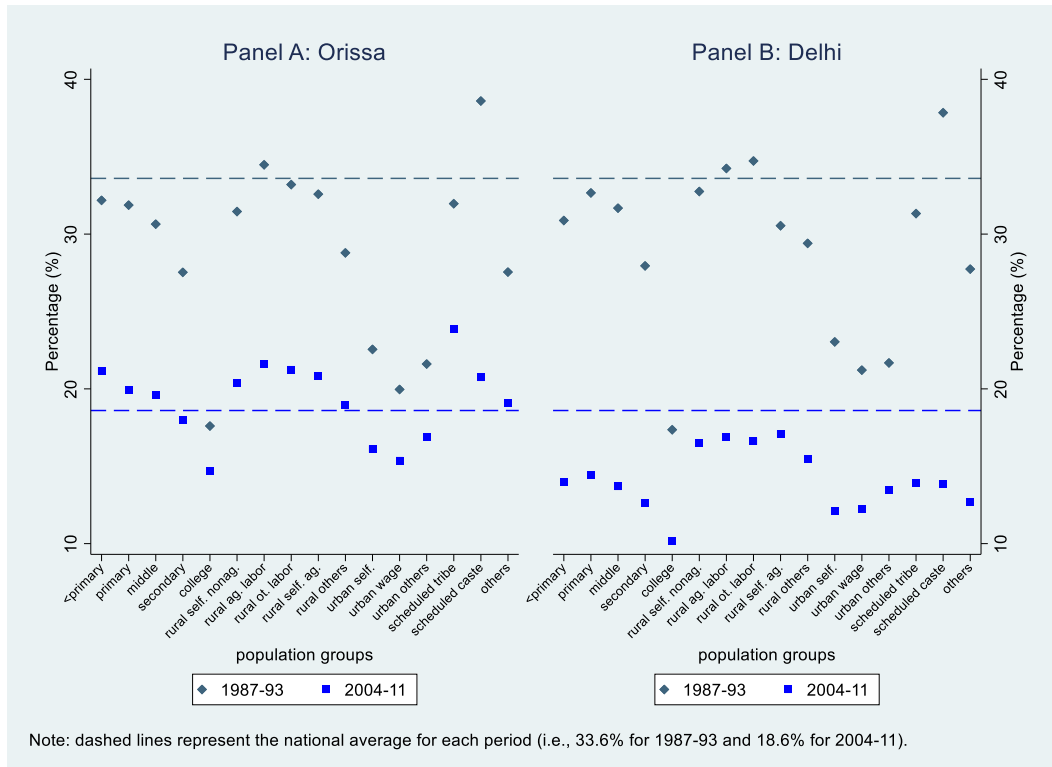
Figure 6: Profiling of the Population that Moved up One or Two Consumption Categories for Orissa vs. Delhi, India 1987/88- 2011/12



Note: Dashed lines represent the national average for each period (i.e. 22.7 per cent for 1987–93 and 45.7 per cent for 2004–11).

Source: authors' calculations based on NSS data.

Figure 7: Profiling of the Population that Moved down One or Two Consumption Categories for Orissa vs. Delhi, India 1987/88- 2011/12



Note: Dashed lines represent the national average for each period (i.e. 33.6 per cent for 1987–93 and 18.6 per cent for 2004–11).

Source: authors’ calculations based on NSS data.

Appendix A. Additional Tables

Table A.1: Estimation model of household consumption, India 1987/88- 2011/12

	1987/88- 1993/94		1993/94- 2004/05		2004/05- 2011/12	
	1987/88	1993/94	1993/94	2004/05	2004/05	2011/12
Female head	0.065*** (0.005)	0.075*** (0.005)	0.087*** (0.005)	0.110*** (0.006)	0.071*** (0.006)	0.078*** (0.006)
Age	0.004*** (0.000)	0.006*** (0.000)	0.004*** (0.000)	0.005*** (0.000)	0.006*** (0.000)	0.003*** (0.000)
Hindu	-0.131*** (0.007)	-0.106*** (0.007)	-0.095*** (0.007)	-0.189*** (0.007)	-0.176*** (0.007)	-0.193*** (0.008)
Islam	-0.241*** (0.008)	-0.245*** (0.008)	-0.204*** (0.008)	-0.303*** (0.008)	-0.315*** (0.008)	-0.328*** (0.009)
Scheduled tribe	-0.214*** (0.005)	-0.175*** (0.006)	-0.158*** (0.005)	-0.240*** (0.006)	-0.266*** (0.005)	-0.286*** (0.006)
Scheduled caste	-0.150*** (0.004)	-0.188*** (0.004)	-0.160*** (0.004)	-0.167*** (0.004)	-0.196*** (0.004)	-0.176*** (0.004)
Complete primary education	0.140*** (0.004)	0.093*** (0.005)	0.130*** (0.005)	0.140*** (0.005)	0.076*** (0.004)	0.055*** (0.005)
Complete middle education	0.238*** (0.005)	0.163*** (0.005)	0.192*** (0.005)	0.241*** (0.004)	0.160*** (0.004)	0.116*** (0.005)
Complete secondary education	0.465*** (0.005)	0.354*** (0.006)	0.378*** (0.006)	0.386*** (0.006)	0.294*** (0.005)	0.218*** (0.006)
Complete senior second education	N/A	N/A	0.485*** (0.008)	0.518*** (0.007)	0.364*** (0.007)	0.304*** (0.007)
Complete graduate education or higher	0.786*** (0.008)	0.699*** (0.007)	0.749*** (0.007)	0.822*** (0.007)	0.665*** (0.007)	0.569*** (0.008)
Urban	0.110*** (0.004)	0.158*** (0.004)	0.137*** (0.004)	0.110*** (0.004)	0.170*** (0.004)	0.226*** (0.004)
Constant	6.040*** (0.010)	5.957*** (0.011)	5.980*** (0.010)	6.123*** (0.011)	6.130*** (0.011)	6.431*** (0.013)
σ_e	0.458	0.437	0.429	0.425	0.438	0.460
Adjusted R2	0.238	0.241	0.272	0.314	0.245	0.222
N	95391	79793	85385	83301	91751	75159

Note: * $p < 0.10$, ** $p < 0.05$ *** $p < 0.01$. Household head's age range is restricted to between 25 and 55 for the first survey round and adjusted accordingly for the second survey round in each period. The senior secondary education category is not available in the 1987/88 round. "N/A" stands for not available.

Table A.2: Welfare Transition Dynamics Based on Synthetic Panel Data at Similar Vulnerability Index Using ρ Value from IHDS Data, India 2004/05- 2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line		2011			
		Poor	Vulnerable	Middle class	Total
2004	Poor	15.5 (0.0)	17.7 (0.0)	3.3 (0.0)	36.5 (0.1)
	Vulnerable	8.6 (0.0)	26.5 (0.0)	13.0 (0.0)	48.1 (0.0)
	Middle class	0.7 (0.0)	5.7 (0.0)	9.0 (0.0)	15.4 (0.1)
	Total	24.8 (0.0)	49.9 (0.0)	25.3 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2011			
		Poor	Vulnerable	Middle class	Total
2004	Poor	15.5 (0.0)	15.3 (0.0)	5.7 (0.0)	36.5 (0.1)
	Vulnerable	7.8 (0.0)	18.0 (0.0)	14.6 (0.0)	40.4 (0.0)
	Middle class	1.4 (0.0)	6.8 (0.0)	14.9 (0.1)	23.1 (0.1)
	Total	24.8 (0.0)	40.1 (0.0)	35.1 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 39,699 and 39,693 for the first and second period respectively. We use ρ value of 0.39 estimated from the IHDS data for 2004-2011.

Table A.3: Welfare Transition Dynamics Based on Synthetic Panel Data, India 2004/05-2009/10 (percentage)

Panel A: Vulnerability line equals twice poverty line		2009			
		Poor	Vulnerable	Secure	Total
2004	Poor	22.4 (0.1)	13.4 (0.0)	0.6 (0.0)	36.5 (0.1)
	Vulnerable	9.0 (0.0)	30.6 (0.0)	8.6 (0.0)	48.1 (0.0)
	Middle class	0.3 (0.0)	5.5 (0.0)	9.7 (0.0)	15.4 (0.1)
	Total	31.6 (0.1)	49.5 (0.0)	18.9 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2009			
		Poor	Vulnerable	Secure	Total
2004	Poor	22.4 (0.1)	12.5 (0.0)	1.6 (0.0)	36.5 (0.1)
	Vulnerable	8.5 (0.0)	21.6 (0.0)	10.3 (0.0)	40.4 (0.0)
	Secure	0.7 (0.0)	6.7 (0.0)	15.7 (0.1)	23.1 (0.1)
	Total	31.6 (0.1)	40.8 (0.0)	27.5 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 91,751 and 76,479 for the first and second period respectively.

Table A.4: Welfare Transition Dynamics Based on Synthetic Panel Data at Similar Vulnerability Index, India 2009/10- 2011/12 (percentage)

Panel A: Vulnerability line equals twice poverty line		2011			
		Poor	Vulnerable	Secure	Total
2009	Poor	15.1 (0.0)	13.7 (0.0)	1.3 (0.0)	30.1 (0.1)
	Vulnerable	8.3 (0.0)	29.9 (0.0)	11.6 (0.0)	49.9 (0.0)
	Secure	0.4 (0.0)	6.5 (0.0)	13.1 (0.1)	20.0 (0.1)
	Total	23.9 (0.1)	50.1 (0.0)	26.0 (0.1)	100
Panel B: Vulnerability line corresponding to V-index= 0.2		2011			
		Poor	Vulnerable	Secure	Total
2009	Poor	15.1 (0.0)	12.3 (0.0)	2.7 (0.0)	30.1 (0.1)
	Vulnerable	7.7 (0.0)	20.4 (0.0)	13.0 (0.0)	41.1 (0.0)
	Secure	1.0 (0.0)	7.6 (0.0)	20.2 (0.1)	28.8 (0.1)
	Total	23.9 (0.1)	40.2 (0.0)	35.9 (0.1)	100

Note: The vulnerability index is defined as twice the poverty line (i.e., 893.4 rupees) in Panel A and that corresponding to a vulnerability index of 0.2 in 2004/05- 2011/12 (i.e., 770 rupees) in Panel B. All numbers are in 2004 price for all rural India. The all rural India poverty line is 446.68 rupees for 2004/05. All numbers are estimated with synthetic panel data and weighted with population weights, where the first survey round in each period is used as the base year. Bootstrap standard errors in parentheses are estimated with 1,000 bootstraps adjusting for the complex survey design. Household head's age range is restricted to between 25 and 55 for the first survey and adjusted accordingly for the second survey in each period. Estimation sample sizes are 73,681 and 73,616 for the first and second period respectively.

Table A.5: Poverty Mobility Relative to the Mean by State over Two Periods, India (percentage)

No	State	1987/88- 1993/94		2004/05- 2011/12	
		(1)	(2)	(3)	(4)
		Upward Mobility	Downward Mobility	Upward Mobility	Downward Mobility
1	Andhra Pradesh	-6.7	-4.4	-2.0	1.1
2	Bihar	-7.7	-2.6	-3.4	2.6
3	Delhi	-8.8	-0.3	8.0	-5.5
4	Gujarat	-6.8	-4.7	-1.9	0.5
5	Haryana	-7.1	-3.5	-0.7	0.3
6	Himachal Pradesh	-8.0	-2.6	-3.1	2.4
7	Karnataka	-6.1	-5.4	-1.6	0.5
8	Kerala	-6.4	-5.0	-0.3	0.1
9	Madhya Pradesh	-6.8	-4.7	-4.6	2.3
10	Maharashtra	-5.7	-6.3	0.1	-0.7
11	Orissa	-7.1	-3.7	-5.3	3.1
12	Punjab	-6.3	-5.5	3.3	-2.4
13	Rajasthan	-7.1	-4.1	-3.4	2.0
14	Tamil Nadu	-5.7	-6.0	0.3	-0.5
15	Uttar Pradesh	-7.2	-3.8	-2.5	1.7
16	West Bengal	-7.6	-3.7	-4.1	2.2
	National average	22.7	33.6	45.7	18.6

Note: Estimates show the difference between the probability of falling into each category relative to the national average (conditional probabilities) and are calculated based on the same estimation results shown in Figures 2 to 3.

Figure A.1: Profiling of the Population that Moved up One or Two Consumption Categories for Assam vs. Punjab, India 1987/88- 2011/12

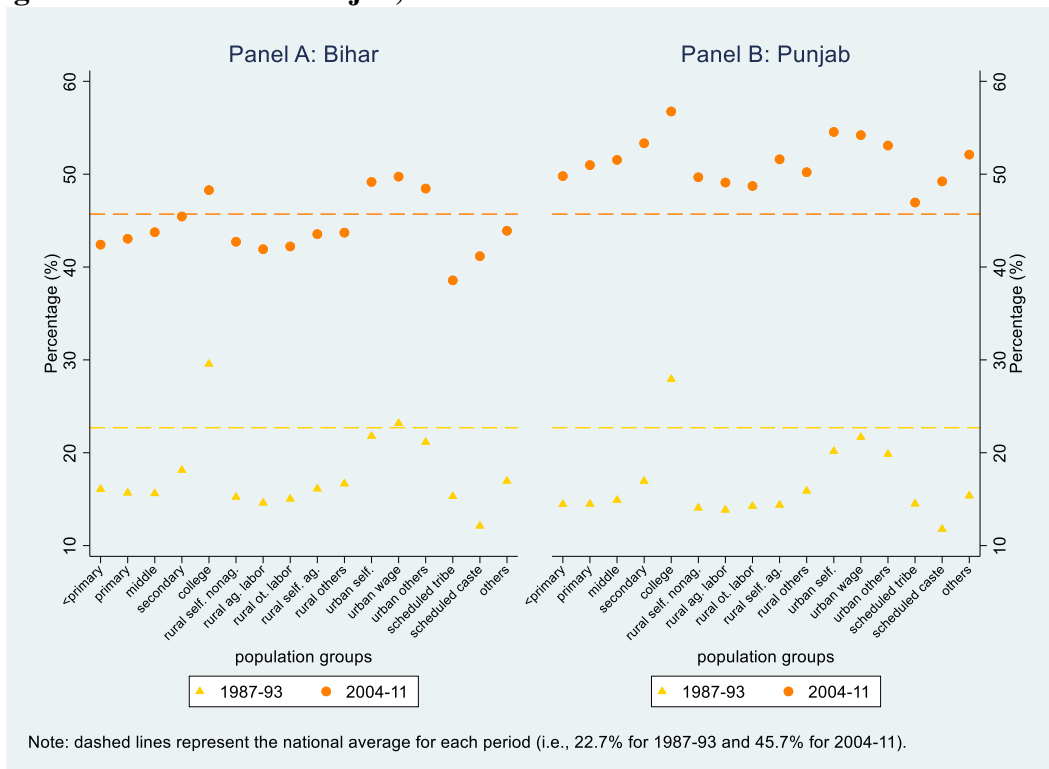


Figure A.2: Profiling of the Population that Moved down One or Two Consumption Categories for Assam vs. Punjab, India 1987/88- 2011/12

