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POVERTY REDUCTION IN RURAL INDIA DURING 2004–2005 TO 2011–2012: ROLE OF GROWTH, REDISTRIBUTION, AND POPULATION-SHIFTS

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We assess the relative importance of factors contributing to poverty reduction in rural India, between 2004–2005 and 2011–2012, a period when India was one of the fastest growing economies of the world, at the national as well as sub-national level. We quantify the relative importance of population shifts across land size classes in determining the pace of poverty reduction vis-à-vis the intra-land size class growth in average consumption and redistribution components. While we do not find population shifts to be a statistically significant factor in explaining poverty reduction, we find that growth in intra land consumption is the dominant factor accounting for poverty reduction in each Indian state as well as at the national level. While the impact of redistribution component varied at the sub-national level, overall, it marginally impeded the pace of poverty reduction at the national level.

JEL Codes: I32, J1

Keywords: poverty change, decomposition, growth and redistribution, population-shifts, rural India

1. Introduction

This paper is a contribution to the empirical literature that seeks to understand the factors contributing to poverty reduction in developing countries. Studies have sought to explain changes in poverty between two points in time by decomposing aggregate change in poverty into component factors, viz. growth of

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consumption expenditures or incomes and its distribution,[1] and quantifying their respective contributions (Datt and Ravallion, 1992; Son, 2003). Recent contributions to this literature have emphasized spatial and temporal differences in the importance of the growth and distribution factors in accounting for changes in poverty. For instance, based on the analysis of data for 76 developing countries for the period of 1990–2010, Alvaredo and Gasparini (2015) find that while the growth component accounts for the bulk of the changes in poverty across various regions of the world, the impact of growth is relatively stronger in Asia and its importance in determining poverty reduction increased during the more recent period of 1999–2010. They also find that depending on the time period of analysis, the redistributive component has either aided or impeded the pace of poverty reduction.

In this paper, we quantify the relative importance of different factors that contributed to poverty reduction in rural India between 2004–2005 and 2011–2012. During this period, rapid economic growth[2] was accompanied by a staggering decline of 110 million in the total number of rural poor.[3] Despite this reduction, rural poor still accounted for 83 percent of the poor in India. Also, India accounted for nearly a third of the world's extreme poor (World Bank, 2013). Progress towards attainment of Sustainable Development Goal 1 pertaining to "no poverty" in South Asia will be determined by India's progress which will be a function of how the different states fare in reducing poverty. Hence it is important to understand the factors that contributed to poverty reduction in rural India.

Land is an important factor of production in rural India and hence can be argued to be the single most important determinant of well-being. Hazell (2015) has written about the inability of small and marginal holders in developing countries to eke out a meaningful living. Land holding has got fragmented over time and estimates from agricultural census document the decline in the average size of land holding over successive decades.[4] As we show later in the paper, over time, the distribution of population by land size class too changed across Indian states. In light of this it is important that, in addition to the aforementioned growth and redistribution component, we also need to estimate the contribution of population shifts across land size groups to reduction in poverty. Son (2003) developed the methodology for estimating the impact of changes in the population distribution

[1]As defined by Datt and Ravallion (1992), "the growth component of a change in the poverty measure is defined as the change in poverty due to a change in the mean while holding the Lorenz curve constant at some reference level L. The redistribution component is the change in poverty due to a change in the Lorenz curve while keeping the mean income constant at the reference level" (p. 277).

[2]India was one of the fastest growing economies of the world with her gross domestic product increasing from $709 billion in 2004 to $1.83 trillion in 2012.

[3]The annual rate of reduction in rural poverty increased from 0.75 percentage points in the period 1993–1994—2004–2005 to 2.32 percentage points in 2004–2005—2011–2012 (Government of India, 2014a).

[4]In the Indian context, the challenge likely to be posed by small land holdings was flagged over a century ago by B. R. Ambedkar who is also credited as the father of the Indian Constitution. Over three decades ago, Sukhomoy Chakravarty, an economist who was involved in India's planning process wrote: "I believe that no sustainable improvement in the distribution of incomes is possible without reducing the 'effective' scarcity of land" (Chakravarty, 1987, p. 5).

TABLE 1
Distribution of Rural Households by Size Class of Land Cultivated during the Agricultural Years

Size Class	1992–1993	1998–1999	2003–2004	2008–2009	2010–2011
Up to 0.40	57.5	63.2	62.1	66.5	67.8
0.41–1.00	17.1	16.8	17.1	15.5	14.2
1.01–2.00	13.5	11.2	11.3	9.5	10.3
2.01–4.00	7.6	5.9	6.5	6.1	5.4
4.01 & above	4.3	3	3	2.5	2.4
Total	100	100	100	100	100

Note: The households with size class of land cultivated "up to 0.40 hectares" comprise households cultivated land less than 0.40 hectares as well as household reported no information on land cultivated.
Source: Government of India (2014b) NSS Report No. 554: Employment and Unemployment Situation in India, 2011–2012.

across various groups, in our case land, alongside the growth and redistribution components.

In addition to providing a context to this paper, the following stylized facts build the rationale for the three-way decomposition. First, declining size of average landholdings is a characteristic of rural India. Between 2003–2004 and 2010–2011, the share of rural households with up to 0.40 hectare of land increased by 5.7 percentage points (Table 1). Estimates from survey of India's agricultural households in 2013 suggest that the average income of a household with less than 1 hectare of land is insufficient to meet their consumption needs.[5] Second, poverty got concentrated, with the share of eight states in India's rural poor increasing from 57.7 percent in 2004–2005 to 64.4 percent in 2011–2012. A feature of these eight states is that over the decade 2001–2011, the rate of growth of their rural population is three times that of other Indian states.[6] These states, known as the Empowered Action Group (EAG) states,[7] an official grouping of states that are yet to undergo demographic transition, are Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odsiha, Rajasthan, Uttarakhand, and Uttar Pradesh. They have relatively higher fertility and mortality indicators as

[5]A comparison over the period 2003–2013 using surveys on Indian agricultural households shows that incomes of household with less than 0.40 hectare of land barely grew by 1.1 times, those with 0.4–1 hectare land grew by 1.38 times while that of those with over 10 hectare land doubled in real terms (Chakravorty *et al.*, 2019).
[6]http://censusindia.gov.in/2011-prov-results/paper2/data_files/india/Rural_Urban_2011.pdf.
[7]In India's XIth Five Year Plan covering the period (2007–2012) there is a discussion around the eight Empowered Action Group States (Bihar, Jharkhand, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Chhattisgarh, Odisha and Rajasthan). Along with Assam they were identified as high focus states because of their "relatively higher fertility and mortality indicators." Among the proximate determinants of TFR are age at first marriage, and age at first birth and these vary by level of education (years of schooling). The median age at first marriage and first birth increases with level of education while TFR is lower among women with additional years of schooling. In order to highlight why these eight states with a concentration of India's rural poor are also characterized as states that lag behind in the demographic transition, one can contrast these indicators with that of Kerala, a southern Indian state with high level of human development. These states lag Kerala in the above three indicators but also on infant mortality and under five mortality rates. It is also true that these states have a concentration of India's rural poor. These states do get a higher share of allocation of funds for poverty reduction and also for addressing lagging maternal and child health indicators.

TABLE 2
TOTAL FERTILITY RATE IN RURAL AREAS BY LAND SIZE CLASS

	NFHS 2015–2016					NFHS 2005–2006				
	Less than 0.01 ha	0.01–0.40 ha	0.41–1.0 ha	More than 1.0 ha	All	Less than 0.01 ha	0.01–0.40 ha	0.41–1.0 ha	More than 1.0 ha	All
*EAG states**										
Bihar	3.93	3.02	2.67	2.88	3.56	4.55	4.34	3.64	2.90	4.22
Chhattisgarh	2.54	2.40	2.29	2.24	2.37	3.14	2.95	2.66	2.75	2.88
Jharkhand	2.90	2.82	2.52	2.66	2.84	4.13	3.61	3.66	3.55	3.69
Madhya Pradesh	2.63	2.49	2.43	2.35	2.48	3.59	3.34	3.23	3.14	3.34
Odisha	2.21	1.98	2.09	2.03	2.11	2.54	2.31	2.65	1.98	2.48
Rajasthan	2.66	2.86	2.50	2.34	2.56	3.70	3.51	3.61	3.55	3.62
Uttar Pradesh	3.42	2.81	2.60	2.41	2.99	4.67	4.20	3.60	3.41	4.13
Uttarakhand	2.40	2.18	1.91	2.02	2.24	2.92	2.76	2.71	2.39	2.67
Other states										
Andhra Pradesh‡	1.98	1.77	1.69	2.07	1.93	1.64	1.76	1.60	1.76	1.66
Assam	2.48	2.09	1.77	2.10	2.34	2.83	2.60	2.57	1.90	2.65
Gujarat	2.17	2.19	2.36	2.37	2.19	3.15	2.60	2.89	2.42	2.80
Haryana	2.45	2.13	2.21	1.77	2.22	3.05	2.82	2.46	2.59	2.92
Karnataka	1.84	1.83	1.92	2.06	1.91	1.87	2.06	2.08	2.19	2.19
Kerala	1.56	1.41	1.32	1.43	1.55	1.81	2.41	2.68	2.32	2.03
Maharashtra	2.10	1.94	1.89	2.09	2.05	2.17	2.22	2.22	2.20	2.31
Punjab	1.75	1.23	1.46	1.43	1.63	2.39	–†	1.88	1.53	2.06
Tamil Nadu	1.87	1.83	1.84	1.81	1.86	1.95	1.84	–†	1.66	1.90
West Bengal	1.94	1.86	1.51	1.61	1.85	2.70	2.28	2.02	1.82	2.54
India	2.49	2.18	2.09	2.16	2.41	2.97	3.10	2.78	2.63	2.98

Notes: A couple of points need to be borne in mind in the context of these estimates. First, the NFHS sample does not generate a precise distribution of households by land size holding. Second, the confidence interval of estimates of TFR in the third and fourth land size class do overlap in some cases but do not overlap in the case of first and fourth or second and fourth land size class.

*Empowered Action Group or EAG states have not undergone the demographic transition and have a large concentration of India's poor. For additional details see text.

†Not enough observations.

‡Observations for Andhra Pradesh in 2015-16 also includes those from Telangana.

Source: Authors Calculations from NFHS unit level data.

compared to other Indian states. Most of these states also have relatively fewer non-farm job opportunities. Third, rural total fertility rate (TFR)[8] declined from 3.7 in 1992–1993 to 3.0 by 2005–2006 and further to 2.4 in 2015–2016. The differences in levels of TFR across the 18 major Indian states in 2005–2006 and 2015–2016 are apparent from Table 2. There has been a reduction in TFR in all land size classes over the two rounds of data. In both years, TFR is higher among the landless and the marginal land holders. In 2015–2016, the TFR by land size class was as follows: 2.49 among those with less than 0.01 hectare of land, 2.18 among those with 0.01–0.40 hectare of land, 2.09 among those with 0.41–1 hectare of land and marginally higher at 2.16 among those with over 1 hectare of land (Table 2). In both the years, the TFR within each land class is generally higher in the EAG states as compared to the other states (Table 2). Fourth, there was no change in the distribution of individuals by work status over the period 2004–2005 and 2011–2012. In fact, the share of workers engaged as casual labor marginally increased (Table 3). However, the wages of those engaged as casual labor or in regular wage/salaried jobs also increased in real terms.[9]

In light of these stylized facts, we ask how the increase in the proportion of rural households in smaller land-size classes, higher population growth in the poorer states, and absence of upward mobility in the labor market affect the pace of poverty reduction.

The contribution of this article is that we quantify for rural India as a whole, as well as for each of its 18 major states, the relative importance of population shifts across land size classes in determining the pace of poverty reduction vis-à-vis the intra-land size class growth in average consumption and redistribution components. Towards this we adapt fairly standard decompositions developed by Ravallion and Huppi (1991), Datt and Ravillion (1992), Kakwani (2000), Shorrocks (2013), and Son (2003).

Our core findings are as follows. We estimate poverty for each year using the Foster *et al*. (1984) class of measures and undertake the decomposition of the factors contributing to its change over the two time periods. When total reduction in poverty is decomposed into changes within land-size groups and population shifts across these groups, we find that the within land-size group component is the predominant factor in accounting for poverty reduction at the national as well as sub-national level. The population shift component is much smaller and also statistically insignificant either at the national level or for any of the states, except for Assam where we find statistically weak evidence for population-shifts impeding poverty reduction. When we account for the factors contributing to the changes in poverty within the land-size classes by decomposing it into intra-group growth and redistribution effects, we find that the within-group growth in mean consumption expenditure is the dominant factor for aiding poverty reduction at the all-India level and for nearly all of the states. While the within-group redistribution component impedes poverty reduction at the

[8]The TFR is the average number of children a woman would have by the end of her childbearing years if she bore children at the current age-specific fertility rates. The TFR is calculated based on sample of women aged 15–49 years.

[9]The average wage/salary earnings of regular wage/salaried employees and casual wage labor increased in real terms over the period 2004–2005 and 2011–2012 (Statement 5.14, Statement 5.15, Government of India, 2014b). See Thomas and Jayesh (2016) for a discussion on geography of new jobs, in particular construction jobs, and differential increases in real wages at the sub-national level.

TABLE 3
Distribution of Persons by Usual Activity Category for Each Household Land Cultivated Class

2004–2005								
2004–2005	0	0.001–0.004	0.005–0.40	0.41–1.00	1.10–2.00	2.01–4.00	4.01	All
Self employed	30.88	28.53	55.01	75.76	85.96	92.31	93.69	60.14
Regular salaried/wage	12.01	12.85	5.83	4.37	3.62	3.53	3.87	7.06
Casual labor	57.11	58.61	39.16	19.87	10.43	4.16	2.44	32.80
Total	100	100	100	100	100	100	100	100
2011–2012								
Self employed	28.68	28.44	56.41	77.38	86.84	90.55	93.97	55.89
Regular salaried/wage	13.42	11.62	6.92	5.00	4.16	4.38	4.18	8.77
Casual labor	57.89	59.94	36.67	17.62	9.01	5.07	1.86	35.34
Total	100	100	100	100	100	100	100	100

Source: Government of India (2014b) NSS Report No. 554: Employment and Unemployment Situation in India, 2011–2012 (Table 26R). Government of India (2006b) NSS Report No. 515(61/10/1) Employment and Unemployment Situation in India, 2004–2005 (Part–II) (Table 27).

all-India level, its magnitude is much smaller than the growth component. The magnitude as well as the direction of the redistribution component varies by state, and by the measure of poverty used, and its impact is statistically significant in about half of the states.

This paper is structured as follows. In Section 2 we describe the data set. We use data from two rounds of survey of consumption expenditure conducted by India's National Sample Survey Organisation (NSSO) in 2004–2005 and 2011–2012. The focus of Section 3 is on the decomposition techniques and results. Section 4 concludes.

2. Data

Data on monthly consumption expenditure of rural households comes from the survey of consumption expenditure conducted by NSSO in 2004–2005 and 2011–2012. The 2004–2005 survey canvassed information from 79,298 households while the 2011–2012 survey from 59,695 households. Both rounds of data are comparable, and are representative at the national and sub-national level. The details of the sampling procedures are available in the reports published by Government of India (2006a, 2014c).

Estimates of the monthly consumption expenditure of the households are considered reliable and have been widely accepted in the literature. The monthly consumption expenditure of the household is the sum of expenditure on food, durable goods and services. The expenditure on some items is measured over a 30-day recall period while others are on both a 30-day and a 365-day basis. When the expenditure is calculated based on 30 day recall it is referred to as uniform reference period. When the expenditure is calculated based on 30 day recall for certain items and 365 day recall (scaled down to 30 days by multiplying the factor 30/365) then it is called mixed reference period. In line with convention, we use the monthly consumption expenditure calculated using mixed reference period.

Based on NSSO surveys, it is an accepted practice to generate estimates of distribution of households by seven land size categories (Government of India, 2014b).[10] We group households into four coarser categories, viz. less than 0.01 hectare, 0.01–0.40 hectare, 0.41–1.0 hectare and greater than 1.0 hectare.

The monthly per capita expenditure (MPCE) is the ratio of monthly consumption expenditure to household size. The average MPCE in rural India was Rs 579 in 2004–2005 while it was Rs 1287 in 2011–2012. While the average MPCE increased by 2.22 times the rural price deflator increased by 1.81 times.

All members of a household are deemed to be poor if the household's monthly per capita consumption expenditure is less than the poverty line. We use the rural poverty line recommended by the Expert Group on Methodology for Estimation of Poverty (Government of India, 2009). The Expert Group which was appointed by Government of India constructed all the India poverty line and the state poverty lines.

[10]The distribution of population by land size class in each state in 2004–2005 and 2011–2012 is similar in both the survey of consumption expenditure and the survey of employment and unemployment which was also conducted in the same years.

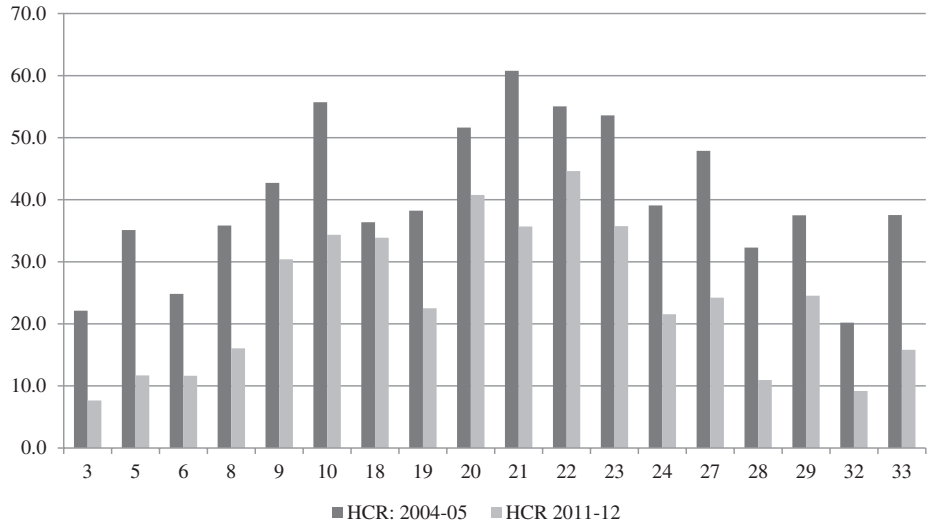

Figure 1. Rural Head Count Ratio (HCR) of Poverty (%) in 2004–2005 and 2011–2012
Notes: State Codes: 3: Punjab, 5: Uttarakhand, 6: Haryana, 8: Rajasthan, 9: Uttar Pradesh, 10: Bihar, 18: Assam, 19: West Bengal, 20: Jharkhand, 21: Odisha, 22: Chhattisgarh, 23: Madhya Pradesh, 24: Gujarat, 27: Maharashtra, 28: Andhra Pradesh, 29: Karnataka, 32: Kerala, 33: Tamil Nadu.
Source: Authors' Calculations.

In all the 18 major states head count ratio of poverty declined between 2004–2005 and 2011–2012 (Figure 1 and Table 4) although there are important differences in the rates of poverty reduction across the states. We also plot the percentage decline in head count ratio of poverty and the percentage increase in mean MPCE[11] for each of the four land size classes in each state (Figure 2). We find a positive a correlation of 0.52. It is not true that the growth in mean consumption is highest in the lowest land size class of all states with a concentration of poverty. Among the eight poorer states, there are three states, viz. Chhattisgarh, Jharkhand and Uttar Pradesh, where poverty reduction was impeded by low growth of mean consumption expenditure among those with less than 1 hectare of land. Across all states, the growth in consumption in the bottom two land classes was the lowest in Chhattisgarh. We also identify states where there is an over representation of the poor among households with 0–0.41 hectares of land. We compute the total number of poor in the land size class and then calculate the share of each state. Similarly, we calculate the share of each state in the total population in the land size class. We then take the ratio of these two shares. A value greater than 1 would imply a concentration of poor in a particular state. We do find that barring Rajasthan and Uttarakhand this ratio is not only higher than 1 in all the other poorer states but also increased over the period 2004–2005 and 2011–2012, except in the case of Bihar (Table 5).

[11]There is one important channel that contributed to differences in extent of poverty reduction across Indian states. Expansion of subsidized rice and wheat available from the public distribution system resulted in an increase in the consumption expenditure of households especially of the poor. Rahman (2014) has estimated the change in implicit income transfer because of increase in coverage under the public distribution system.

TABLE 4
Rural Head Count Ratio of Poverty (HCR) (%), Number of Rural Poor (in lakhs) and Share of each State in All India Rural Poor

	2004–2005			2011–2012			Percentage Change in HCR
	HCR	Number of Poor	Share of Poor	HCR	Number of Poor	Share of Poor	
EAG states							
Bihar	55.7	445.1	13.6	34.1	320.4	14.8	38.8
Chhattisgarh	55.1	96.5	3	44.6	88.9	4.1	19.1
Jharkhand	51.6	115.1	3.5	40.8	104.1	4.8	20.9
Madhya Pradesh	53.6	255.3	7.8	35.7	191	8.8	33.4
Odisha	60.8	197.3	6	35.7	126.1	5.8	41.3
Rajasthan	35.8	167.2	5.1	16.1	84.2	3.9	55.0
Uttar Pradesh	42.7	604.7	18.5	30.4	479.4	22.1	28.8
Uttarakhand	35.1	23.3	0.7	11.6	8.2	0.4	67.0
Other major states							
Andhra Pradesh	32.3	187.1	5.7	11	61.8	2.9	65.9
Assam	36.4	88.8	2.7	33.9	92.1	4.3	6.9
Gujarat	39.1	130.1	4	21.5	75.4	3.5	45.0
Haryana	24.8	39.3	1.2	11.6	19.4	0.9	53.2
Karnataka	37.5	135	4.1	24.5	92.8	4.3	34.7
Kerala	20.2	49.5	1.5	9.1	15.5	0.7	55.0
Maharashtra	47.9	277.1	8.5	24.2	150.6	7	49.5
Punjab	22.1	36.5	1.1	7.7	13.4	0.6	65.2
Tamil Nadu	37.5	125.6	3.8	15.8	59.2	2.7	57.9
West Bengal	38.2	231.2	7.1	22.5	141.1	6.5	41.1
India	41.8	3266.6		25.7	2166.6		38.5

Source: Authors Calculations.

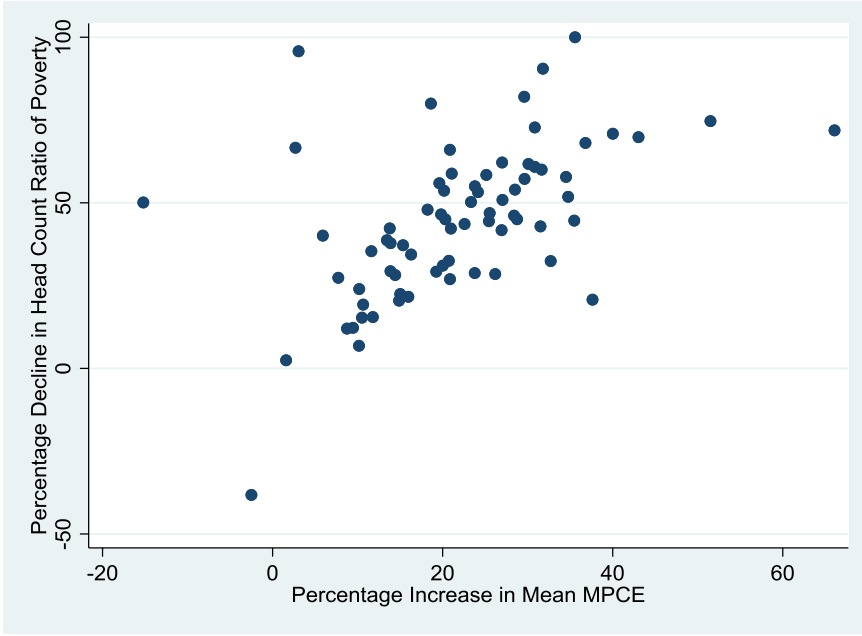

Figure 2. Percentage Change in Rural Head Count Ratio (HCR) and Percentage Change in Mean MPCE by Land Size Class in 18 Major States
Source: Authors' Calculations. [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 5
Ratio of Share of Rural Poor in the Land Size Class 0–0.40 hectare to the Share of Rural Population in Land Size Class 0–0.40 hectare

	2004–2005	2011–2012
EAG states		
Bihar	1.43	1.37
Chhattisgarh	1.27	1.75
Jharkhand	1.15	1.44
Madhya Pradesh	1.30	1.64
Odisha	1.24	1.36
Rajasthan	0.98	0.92
Uttar Pradesh	1.10	1.30
Uttarakhand	0.83	0.49
Other major states		
Andhra Pradesh	0.65	0.32
Assam	1.15	1.30
Gujarat	0.94	0.65
Haryana	0.75	0.62
Karnataka	0.90	0.85
Kerala	0.46	0.34
Maharashtra	1.11	1.07
Punjab	0.65	0.36
Tamil Nadu	0.89	0.58
West Bengal	0.90	0.85

Notes: Empowered Action Group or EAG states have not undergone the demographic transition. For additional details see text. Poverty is measured as per the Head Count Ratio.
Source: Authors' Calculations.

3. Decomposition of Change in Poverty

The ensuing discussion pertains to decomposition of change in rural poverty over the period 2004–2005 and 2011–2012. We employ the class of decomposable poverty measures proposed by Foster *et al*. (1984); (commonly referred to as FGT in the literature). In the analysis that we undertake we focus on the change in the level of poverty rather than the percentage change in poverty, as measured by head count ratio (FGT-0), poverty gap ratio (FGT-1) or squared poverty gap ratio (FGT-2).[12]

Let P_{st} and P_{st+1} be the rural poverty at time t (2004–2005) and $t + 1$ (2011–2012) respectively in state s. Then the change in poverty in state s is written as

$$\Delta P_s = P_{st+1} - P_{st} \tag{1}$$

3.1. *Population Shifts and Change in Poverty*

There could be multiple reasons why poverty can decline at differential rates across Indian states. We explore one plausible channel, viz. changes in the distribution of population across land size groups. Land is an important determinant of well-being of rural households. A stylized fact is that those with more than 1 hectare of land are less likely to be poor. In this scenario an increase in the share of population of large land holders could also reduce poverty. We provided evidence of not only differences in TFR across land size classes but also how the rate of reduction in TFR varies across states. These in turn could influence pace of poverty reduction. Hence, we address the contribution of population shifts across land size groups to poverty reduction.

Let us assume that individuals are distributed across g land size groups (in our case we have four land size groups: less than 0.01 hectare, 0.01–0.40 hectare, 0.41–1.0 hectare and greater than 1.0 hectare). While we have grouped population by land size classes, in the extant literature researchers have estimated poverty by region (rural or urban), educational attainment etc.

By way of notation v_{sgt} and P_{sgt} are, respectively, the population share and poverty in state s in land size group g in time t. Then P_{st} which is the poverty at time t in state s can be written as follows.

$$P_{st} = \sum_{g=1}^{4} v_{sgt} P_{sgt} \tag{2}$$

The change in poverty across two points of time $t + 1$ and t can be written as follows

$$\Delta P_s = \sum_{g=1}^{4} \left[v_{sgt+1} P_{sgt+1} - v_{sgt} P_{sgt} \right] \tag{3}$$

[12]The rationale for looking at FGT(0), FGT(1) and FGT(2) has been clearly laid out in Datt and Ravallion (1992, p. 287). Since FGT(0) is the head count ratio of poverty it does not measure the depth of poverty.

We follow the approach taken by Shorrocks (2013) for decomposing Equation 3.[13]

$$\Delta P_s = \sum_{g=1}^{4}\left[\left(\frac{v_{sgt}+v_{sgt+1}}{2}\right)\Delta P_{sg}\right] + \sum_{g=1}^{4}\left[\left(\frac{P_{sgt}+P_{sgt+1}}{2}\right)\Delta v_{sg}\right] \tag{4}$$

where $\Delta P_{sg} = P_{sgt+1} - P_{sgt}$ and $\Delta v_{sg} = v_{sgt+1} - v_{sgt}$.

The first term on the right hand side of equation (4) is the contribution of changes in poverty[14] within land size groups and the second term is the change in poverty because of population shifts.

3.2. *Contribution of Growth, Inequality and Population Shifts*

The above discussion pertained to quantifying the relative importance of changes in poverty within land size groups, *i.e.* the intra land component vis-à-vis the component capturing population shifts across land size groups. A traditional question in the literature on poverty measurement is the extent to which growth and redistribution factors influence change in poverty dynamics (*e.g.* Datt and Ravallion, 1992; Kakwani, 2000). Given this, it is of interest to measure the extent to which intra land size group change in poverty is determined by intra group growth vis-à-vis redistribution factors. Moreover, this would help us gauge the relative influence of the population shift effect in relation to the growth and redistribution factors. Son (2003) develops the methodology for decomposing the first component of the right hand side of equation 4 into sum of within land size group growth effect $\left(\Delta P_s\right)_m$, and within land size group inequality effect $\left(\Delta P_s\right)_I$.

$$\begin{aligned}\Delta P_s = &\sum_{g=1}^{4}\left[\left(\frac{v_{sgt}+v_{sgt+1}}{2}\right)\left(\Delta P_{sg}\right)_m\right] + \sum_{g=1}^{4}\left[\left(\frac{v_{sgt}+v_{sgt+1}}{2}\right)\left(\Delta P_{sg}\right)_I\right]\\ &+ \sum_{g=1}^{4}\left[\left(\frac{P_{sgt}+P_{sgt+1}}{2}\right)\Delta v_{sg}\right]\end{aligned} \tag{5}$$

For each land size class, the terms $\left(\Delta P_s\right)_m$ and $\left(\Delta P_s\right)_I$ can be written as follows (we have suppressed the suffix g).

$$\left(\Delta P_s\right)_m = \frac{1}{2}\left[P\left(z,\mu_{t+1},L_t(p)\right) - P\left(z,\mu_t,L_t(p)\right) + P\left(z,\mu_{t+1},L_{t+1}(p)\right) - P\left(z,\mu_t,L_{t+1}(p)\right)\right] \tag{6a}$$

[13]Shorrocks' (2013) decomposition methodology proposes a solution that overcomes several problems associated with traditional decomposition techniques such as the lack of meaningful interpretation of the contribution of factors, constraints on the usage of indices, limitations on the type of contributory factors that can considered, as well as the lack of an overall framework for the decomposition analyses. This methodology is shown to be formally equivalent to the Shapley value of cooperative game theory.

[14]Note that equation 4 can be written equivalently for absolute change in poverty or the percentage change in poverty.

$$(\Delta P_s)_I = \frac{1}{2}\left[P\left(z, \mu_t, L_{t+1}(p)\right) - P\left(z, \mu_t, L_t(p)\right) + P\left(z, \mu_{t+1}, L_{t+1}(p)\right) - P\left(z, \mu_{t+1} + L_t(p)\right)\right] \quad (6b)$$

In terms of notation $P(z, \mu, L(p))$ is the measure of poverty, z is the poverty line in real terms which is not dependent of land size class, μ_t is the mean consumption in society in time period t, and $L_t(p)$ is the Lorenz curve of the distribution of the welfare indicator, in our case household's monthly per capita consumption expenditure, at time period t. The decomposition is based on the fact that, given a poverty line, the poverty level at a point in time can be expressed as a function of mean consumption and the Lorenz curve.

3.3. *Findings*

As can be seen from equation (4) above, the magnitude of the 'population shift' effect depends on the change in share of population in each land size class (Table 6a) along with the average poverty levels within each land-size group, which is determined by the initial period's poverty level within each land-size group as well as the changes in poverty between 2004–2005 and 2011–2012 (Table 6b provides this change for FGT (0)).

As seen from Table 6a there is an increase in the share of population with 0.01–0.41 hectare of land though the magnitude varies across states. Among the EAG states, the increase is much larger than the India average, in the case of Bihar and Jharkhand in particular, followed by Uttarakhand. Among the other major states, Punjab is an exception. When the bottom two land size groups are considered together, there is a substantial net increase in the share of population in these categories across most EAG states, excepting Chhattisgarh and Odisha. In addition, except for the case of West Bengal, none of the non-EAG states witnessed movement into the first land category.

Given that lower land size classes are more likely to be poorer, we prima facie expect the population shift into these categories to be poverty increasing for the respective states. The results in Table 7 provide the estimates based on Shorrocks' (2013) decomposition of change in poverty into intra-group and population shift components (*i.e.* based on equation (4)). Our focus is on what percentage of the reduction in poverty can be attributed to changes in poverty within land size groups and what percentage can be attributed to population-shift. The two percentages will add up to 100. As can be seen, contrary to what we expected and irrespective of the poverty measure used, the magnitude of the population shift is small even for the EAG states, and is not statistically significant for any state except for Assam, where we find statistically weak evidence for population-shifts impeding poverty reduction. In all the states as well as all-India we instead find the intra-land component to be accounting for almost all the reduction in poverty and is highly statistically significant, irrespective of the poverty measured used.

What explains the underwhelming role of the population shift component? We provide some pointers by highlighting the importance of the following state-level factors: first, consider the case of Jharkhand which witnessed the largest increase in population into the second land category. This movement is driven

TABLE 6A
CHANGE IN SHARE OF POPULATION IN FOUR LAND SIZE CLASSES BETWEEN 2004–2005 AND 2011–2012

	Less than 0.01 ha	0.01–0.40 ha	0.41–1.0 ha	More than 1.0 ha	Total
EAG states					
Bihar	−8.6	19.8	−4.4	−6.8	0.0
Chhattisgarh	−4.2	3.8	4.0	−3.6	0.0
Jharkhand	1.1	21.5	−15.1	−7.5	0.0
Madhya Pradesh	7.5	0.1	−0.9	−6.7	0.0
Odisha	−7.4	7.8	3.6	−4.0	0.0
Rajasthan	3.4	4.6	−2.7	−5.4	0.0
Uttar Pradesh	−1.1	8.1	−0.9	−6.1	0.0
Uttarakhand	3.8	15.5	−17.5	−1.9	0.0
Other major states					
Andhra Pradesh	−5.00	7.00	1.09	−3.08	0.0
Assam	0.04	8.90	4.39	−13.32	0.0
Gujarat	−3.92	5.67	−0.05	−1.72	0.0
Haryana	−6.01	7.24	−4.14	2.91	0.0
Karnataka	−5.97	3.17	3.09	−0.29	0.0
Kerala	−0.67	8.37	−6.15	−1.55	0.0
Maharashtra	−5.02	9.22	−1.61	−2.59	0.0
Punjab	−15.64	18.72	0.29	−3.38	0.0
Tamil Nadu	−2.58	6.54	−2.76	−1.19	0.0
West Bengal	3.84	11.55	−8.49	−6.88	0.0
India	−2.32	9.23	−2.06	−4.83	0.0

Source: Calculations based on Unit Level Data from NSSO Survey of Consumption Expenditure 2004–2005 and 2011–2012.

TABLE 6B

CHANGE IN RURAL HEAD COUNT RATIO OF POVERTY IN FOUR LAND SIZE CLASSES BETWEEN 2004-05 AND 2011–2012

	Less than 0.01 ha	0.01–0.40 ha	0.41–1.0 ha	More than 1.0 ha	All Classes
EAG states					
Bihar	−21.33	−29.89	−23.91	−4.20	−21.2
Chhattisgarh	−1.29	−18.58	−13.72	−9.32	−10.5
Jharkhand	−8.61	−15.51	−11.92	−2.87	−10.9
Madhya Pradesh	−12.63	−24.17	−23.68	−19.74	−17.8
Odisha	−28.25	−18.34	−29.26	−30.23	−25.2
Rajasthan	−16.23	−22.74	−22.77	−20.35	−19.8
Uttar Pradesh	−16.43	−15.68	−14.74	−8.62	−12.3
Uttarakhand	−37.40	−22.37	−27.20	−14.21	−23.4
Other major states					
Andhra Pradesh	−25.41	−15.39	−26.27	−15.98	−21.1
Assam	−41.47	−15.30	−5.00	7.39	−2.5
Gujarat	−23.89	−34.14	−13.84	−5.28	−17.7
Haryana	−19.62	−13.53	−19.04	−1.89	−13.1
Karnataka	−20.02	−15.45	−18.10	−3.68	−13.0
Kerala	−18.17	−12.30	−4.31	−8.54	−10.9
Maharashtra	−23.38	−18.91	−28.71	−23.84	−23.7
Punjab	−21.28	−14.03	−4.79	−2.34	−14.6
Tamil Nadu	−28.89	−21.56	−16.49	−4.18	−21.7
West Bengal	−18.76	−19.17	−12.91	−14.88	−15.5
India	−20.61	−18.21	−17.08	−12.20	−16.3

Note: Change in Poverty Gap Index and Squared Poverty Gap Index available on request.

Source: Calculations based on Unit Level Data from NSSO Survey of Consumption Expenditure 2004-05 and 2011–2012.

TABLE 7
CONTRIBUTION OF POPULATION SHIFTS ACROSS LAND SIZE CLASS & IMPROVEMENTS WITHIN LAND SIZE CLASSES TO CHANGE IN POVERTY BETWEEN 2004–2005 AND 2011–2012

	FGT (0)		FGT (1)		FGT (2)	
Component	A	B	A	B	A	B
EAG states						
Bihar	106***	−6	104***	−4	102***	−2
Chhattisgarh	107***	−7	103***	−3	102***	−2
Jharkhand	105***	−5	106***	−6	104***	−4
Madhya Pradesh	108***	−8	111***	−11	115***	−15
Odisha	102***	−2	101***	−1	101***	−1
Rajasthan	106***	−6	107***	−7	108***	−8
Uttar Pradesh	114***	−14	112***	−12	112***	−12
Uttarakhand	106***	−6	107***	−7	107***	−7
Other major states						
Andhra Pradesh	98***	2	97***	3	97***	3
Assam	207**	−107	156***	−56*	139***	−39*
Gujarat	101***	−1	101***	−1	102***	−2
Haryana	95***	5	94***	6	94***	6
Karnataka	97***	3	96***	4	95***	5
Kerala	104***	−4	103***	−3	101***	−1
Maharashtra	100***	0	99***	1	99***	1
Punjab	87***	13	85***	15	84***	16
Tamil Nadu	100***	0	99***	1	99***	1
West Bengal	114***	−14	112***	−12	111***	−11
India	103***	−3	103***	−3	102***	−2

Notes: Empowered Action Group or EAG states have not undergone the demographic transition. For additional details see text. Component A: Contribution of changes in poverty within land size groups. Component B: Contribution of population shifts: A + B = 100.

***p-value < 0.01. **p-value between 0.01 and 0.05. *p-value between 0.05 and 0.1.

Source: Authors' Calculations.

by a shift largely from the third category, followed by the fourth category. The reason why such substantial shifts from the third to the second category do not get picked up in the population shift component is because the extent of poverty (*i.e.* after averaging across the two years as in (4)) in the second and third land-size category is almost the same,[15] regardless of the measure of poverty used. Thus, if the population is shifting between two land size categories with similar levels of poverty, then it is not surprising that this shift does not have a substantial impact on total poverty change. Similar is the case with Chhattisgarh, where substantial movement is happening from the first and fourth to second and third categories. Surprisingly the first category has lower average poverty (as per FGT (0)) than the second in Chhattisgarh. So this movement is poverty increasing as seen in Table 7. However, this difference in poverty across these two land size classes is negligible for FGT(1, 2) and thus, we can see in Table 7 that the magnitude of the population shift component reduces as we move to higher order poverty measures.

[15]Detailed tables with state-wise poverty (averaged across the two years) across land size classes are not provided here but are available on request.

On the other hand, in states where the differences in the average poverty rates across the land size categories are large, the population shift component is substantial. This is evident from Assam, where the average FGT(0) in the second (45 percent) and third (39 percent) categories into which the population shift is happening is almost twice of that of the fourth (23 percent) category from where it is shifting. These inter-land group differences in poverty rate persist for other higher order poverty measures too. Similar inter-group differences are also the reasons behind high population shift component in the case of Punjab as well as West Bengal.

In the case of Bihar and Uttarakhand, it is worth pointing out that the extent of population shift component is not very different from the level in Uttar Pradesh (for Uttarakhand) and Madhya Pradesh (for Bihar). However, since the extent of total poverty reduction in these states (*i.e.* Bihar and Uttarakhand) is quite high (Tables 4 and 6b), the *proportion* of poverty reduction attributable to population shifts appears small in Table 7. Similar is the case with Odisha. However, for none of the states, except for Assam, is the absolute level of the population shift effect statistically significant.

Given that the within land-size class changes is the most important factor behind poverty reduction across all the states as well as at the national-level, we decompose the within group further into the growth and redistribution effects leading to a three-way decomposition of growth, redistribution, and population shifts, referred to in equation (5). The results of this exercise are given in Table 8 and it shows that the within-group growth component is the largest driver of poverty reduction and is highly significant for all states as well as at the national-level. While the within-group redistribution component impedes poverty reduction at the all-India level, its magnitude is much smaller than the growth component. The magnitude as well as the direction of the redistribution component varies by state, and by the measure of poverty used, and its impact is statistically significant in about half of the states.

As outlined earlier, there are substantial differences in the extent of poverty reduction among states (Tables 4 and 6b). For instance, poorer states such as Chhattisgarh, Jharkhand, and Uttar Pradesh have experienced a much slower rate of poverty reduction than others even among the EAG states. On the other hand, are poorer states such as Odisha, as well as Bihar and Rajasthan to a lesser extent, which have experienced impressive rates of poverty reduction during this time period. Our analysis in Table 8 helps shed some light on the proximate explanations for these state-level differences in the rate of poverty reduction.

As shown in Tables 7 and 8, rate of poverty reduction in Chhattisgarh, Jharkhand, and Uttar Pradesh, is being entirely driven by changes within the land-size component (Table 7), and in particular through the growth component within the land-size classes (Table 8). This suggests that the roots of underwhelming poverty reduction in these states should lie in comparatively low growth rates in mean per-capita consumption expenditures across land-size classes. It is indeed found that these states have experienced relatively low growth rates during this time period.[16]

On the other hand, Odisha's poverty reduction is attributable to higher growth performance as evident from high growth in mean per-capita consumption expenditures across all land-size classes. Moreover, favorable distributional changes

[16]This is the same data that is used for Figure 2. Detailed table is available on request.

TABLE 8
DECOMPOSITION OF POVERTY REDUCTION INTO WITHIN GROUP GROWTH, WITHIN GROUP INEQUALITY AND POPULATION SHIFTS ACROSS LAND SIZE GROUPS

	FGT (0)			FGT (1)			FGT (2)		
	Within Group Growth Effect	Within Group Inequality Effect	Population Shift Effect	Within Group Growth Effect	Within Group Inequality Effect	Population Shift Effect	Within Group Growth Effect	Within Group Inequality Effect	Population Shift Effect
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
EAG states									
Bihar	114***	−9	−6	125***	−22***	−4	131***	−28***	−2
Chhattisgarh	107***	0	−7	82***	22	−3	68***	34*	−2
Jharkhand	124***	−18	−5	110***	−4	−6	101***	4	−4
Madhya Pradesh	99***	9	−8	133***	−21	−11	163***	−48**	−15
Odisha	93***	10**	−2	85***	17***	−1	81***	20***	−1
Rajasthan	108***	−2	−6	127***	−21**	−7	161***	−53***	−8
Uttar Pradesh	112***	2	−14	117***	−5	−12	124***	−13	−12
Uttarakhand	111***	−5	−6	118***	−12	−7	125***	−18	−7
Other states									
Andhra Pradesh	89***	8	2	85***	13**	3	78***	18***	3
Assam	411***	−204***	−106	247***	−91***	−56*	199***	−60**	−39*
Gujarat	105***	−4	−1	84***	17*	−1	75***	27**	−2
Haryana	32	63**	5	36	58	6	37	57	6
Karnataka	134***	−38**	3	124***	−28	4	125***	−29	5
Kerala	103***	1	−4	89***	14	−3	80***	21	−1
Maharashtra	80***	20***	0	74***	25***	1	77***	22**	1
Punjab	56***	32***	13	63***	22	15	73***	11	16
Tamil Nadu	108***	−8	0	116***	−16*	1	120***	−20*	1
West Bengal	107***	7	−14	101***	12	−12	99***	13	−11
India	109***	−5*	−3	114***	−11***	−3	118***	−15***	−2

Note: A + B + C = 100, D + E + F = 100, G + H + I = 100.
***p-value < 0.01. **p-value between 0.01 and 0.05. *p-value between 0.05 and 0.1.
Source: Authors' Calculations.

during this period contributed towards accelerated poverty reduction in Odisha. This can be seen from the increasing salience of the redistribution components in aiding poverty reduction as per poverty measures that give greater weight to poorer individuals (*i.e.* FGT(1) and FGT(2)) in Table 8. The case of Uttarakhand, which experienced the highest reduction in poverty as per Table 4 is similar, though there is no impact of distributional changes unlike in Odisha and poverty reduction is entirely driven by high growth rate in mean per-capita consumption expenditures.

In the case of other poor states of Bihar, Rajasthan, and Madhya Pradesh, the growth rates are higher than in Chhattisgarh, Jharkhand, and Uttar Pradesh and thus account for the superior rate of poverty reduction in these states. However, these states also experienced adverse distributional changes, especially for those farther away from the poverty line, that impeded the rate of their poverty reduction. This can be seen from the increasingly negative impact of the redistribution component on poverty reduction as one moves from FGT(0) to FGT(2).

Among the non-EAG states, Maharashtra and Andhra Pradesh experienced the greatest absolute reductions in FGT(0). From Table 8, we see that both growth as well as redistribution components have aided poverty reduction suggesting that growth in mean consumption expenditures were accompanied by favorable distributional changes for the poor. In Assam, which witnessed the least reduction in FGT(0), while growth aided poverty reduction, distributional shift during this time period was adverse to the poor. The relative comparison of the redistribution component across FGT(0,1, and 2) suggests that the adverse changes of distribution were partially mitigated for those farther away from the poverty line.

3.4. *Poverty-Growth-Inequality*

Recent studies have analyzed data from multiple countries in order to understand drivers of poverty reduction (Alvaredo and Leonardo, 2015; Fosu, 2017; Clementi *et al.*, 2019; Wan *et al.*, 2021). Consistent with expectations, Wan *et al.* (2021) find that poverty reduction in 22 Asian countries including India is completely driven by growth. Although in magnitude terms the redistribution component was small, in 15 countries, inequality effect was poverty increasing while in seven countries it was poverty decreasing. Where does the Indian experience fit into the larger narrative on poverty reduction in Asia and Africa? And are there regional differences within India in the relative contribution of growth and redistribution components to poverty reduction that are masked by the all-India numbers? In order to answer this question we abstract from the issue of population shifts. It is also of interest to understand the drivers of poverty reduction in the pre and post liberalization era. Datt and Ravallion (1992)[17] find that in the pre-reform era *i.e.* 1977–1978 to 1988, 62 percent of the reduction in poverty, as measured by FGT (2),

[17]The "drdecomp" command in STATA relies on Shorrocks' (2013) framework to decompose change in poverty into growth and redistribution effects using the Shapley value. Shorrocks' method is an exact decomposition unlike that of Datt and Ravallion (1992), which has a residual term in addition to the growth and redistribution component. In the Datt and Ravallion (1992) results, for India, the residual term is small.

TABLE 9
DECOMPOSITION OF CHANGE IN POVERTY INTO GROWTH AND REDISTRIBUTION COMPONENTS

	FGT (0)		FGT (1)		FGT (2)	
	Growth	Redistribution	Growth	Redistribution	Growth	Redistribution
EAG states						
Bihar	105***	−5	110***	−10	114**	−14*
Chhattisgarh	100***	0	77*	23	64	36*
Jharkhand	125***	−25	107***	−7	98	2
Madhya Pradesh	101***	−1	130***	−30**	163*	−63***
Odisha	88***	12*	82***	18***	78***	22***
Rajasthan	105***	−5	128***	−28***	164	−64***
Uttar Pradesh	94***	6	101***	−1	107	−7
Uttarakhand	113***	−13	116	−16	116	−16
Other major states						
Andhra Pradesh	89***	11	82***	18***	76	24***
Assam	240***	−140*	131	−31	95	5
Gujarat	102***	−2	75***	25**	65	35***
Haryana	47***	53***	56	44	59	41
Karnataka	144***	−44**	137***	−37*	134	−34
Kerala	98***	2	83*	17	73	27
Maharashtra	80***	20**	74***	26***	76**	24**
Punjab	87***	13	87	13	93	7
Tamil Nadu	107***	−7	116***	−16*	120*	−20*
West Bengal	89***	11	85***	15	84	16
All-India	107***	−7**	113***	−13***	116***	−16***

Note: Sum of growth and redistribution component equals 100.
***p-value < 0.01. **p-value between 0.01 and 0.05. *p-value between 0.05 and 0.1.
Source: Authors' Calculations.

in rural India, could be attributed to the growth component and 47 percent to redistribution effects. Using Shorrocks' (2013) methodology, in the period 2004–2005—2011–2012, we find the contribution of growth and redistribution to be 107 percent and—7 percent respectively. Even when we use the Datt and Ravallion methodology the magnitudes are in the same ball park.[18] This implies that, in rural India, unlike in the pre-reform period, in the recent decade of the post-reform era, where India was among the fastest growing economies and for which the data are available, inequality marginally reduced the pace of reduction in rural poverty. The all India estimates mask state specific differences. At the sub-national level, we find that while growth continues to be the most important driver of poverty reduction, in about half of the states analyzed, the redistribution component is significantly influencing poverty reduction. With respect to the direction, inequality is shown to have a substantial adverse effect on poverty reduction in relatively poorer states of Madhya Pradesh and Rajasthan, particularly for those farther away from the poverty line. In some other states, including relatively poorer Odisha, as well as in Maharashtra and Andhra Pradesh, the redistribution effect is positive (Table 9). Only in case of one state, *i.e*. Haryana, and only in the case of the FGT (0) measure, the redistribution effect is positive and also greater than the growth effect.

4. Conclusion

While India made substantial progress in reduction of rural poverty there was a geographical unevenness in this reduction. In this paper we open another avenue in the literature on poverty reduction[19] in India in order to better understand what drives this unevenness. We quantify the factors that contributed to poverty dynamics in rural India during 2004–2005 and 2011–2012. We decompose the change in rural poverty into growth, distributional, and population shift effects across land sizes classes.[20] In the absence of structural transformation, the continued preponderance of economic activity in agriculture and allied activities combined with fewer non-farm opportunities calls to attention the centrality of land, a crucial input into the sector, on the dynamics of poverty reduction. It is for this reason that sub-group analysis by land size class is of importance. The period we analyze was characterized by substantial variation in poverty reduction at sub-national level. The three key findings are as follows. First, we find that population shifts are not statistically significant in explaining

[18]For the period between 2004–2005 and 2011–2012, we replicated the decomposition method used by Datt and Ravallion (1992). We use the "dfgtgr" command in STATA.

[19]The focus of a recent paper by Datt *et al*. (2019), who examine a period of six decades, is on understanding the relative importance of growth in primary, secondary and tertiary sectors to poverty reduction.

[20]This is not to suggest that population shifts from rural to urban areas driven by migration are not important. Bhanumurthy and Mitra (2014) find that between 1993–1999 and 1983–1994 the component accounting for population shifts between rural and urban areas accounts for 2.59 percent and 1.64 percent of poverty reduction, respectively. The evidence presented in the World Development Report 2008 suggested that in developing countries rural-urban migration has not significantly contributed to rural poverty reduction. According to the Report, "more than 80 percent of the decline in rural poverty is attributable to better conditions in rural areas rather than to out-migration of the poor World Bank (2007, p. 3).

poverty reduction. Second, growth is the primary driver of poverty reduction. Intra-land size class reduction in poverty is the most important driver. Third, unlike in the pre-reform period, in the post-reform era, inequality reduced the pace of reduction in rural poverty, albeit marginally.

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