Income and inequality across rural-urban, occupational and caste divides: India in 2014-19

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Abstract:
We study the evolution of income in India from 2014-19 and find that the lower end of the income distribution has experienced significant losses – the bottom ventile shows not only a decline in income share of \(~41\%\), but also negative real average income growth of \(-5.5\%\) per annum. We further investigate the composition of this part of the distribution using rural and urban splits, and find that even as income shares at the bottom of the urban distribution have increased over time, those at the bottom of the rural distribution have decreased – income share of bottom decile of the rural income distribution declined by \(~43\%\), and real average income growth of this decile was \(-5\%\) per annum. We also empirically confirm that the bottom ventile of the consolidated Indian income distribution is composed primarily of rural incomes, and therefore the decline in real incomes is essentially a rural phenomenon. We model the extent of reallocation in the Indian income distribution since 2014 and find that reallocation has been decreasing from 2015 and even turned negative in 2018, which is in keeping with empirical evidence of real income declines at the bottom of the distribution. Further, we find that the bottom decile of the Indian income distribution is composed of small/marginal farmers and agricultural labour belonging predominantly to Scheduled Caste and Scheduled Tribe populations, highlighting both their increasing economic fragility and deepening povertization over time. These trends are exacerbated by findings from our model which suggest that incomes at the bottom of the income distribution are sticky, and escape to higher parts of the distribution over time is rare. Providing sustained income support to the bottom of the income distribution is therefore an immediate economic priority.

Keywords: Income, inequality, distribution, poverty, India, dynamics

\textbf{JEL:} D31, O15, D63
1. Introduction

The past 30 years have seen the inexorable rise of income inequality in India (Chancel & Piketty, 2019). This has been caused through a combination of global technological and economic changes as well as structural conditions in the Indian economy since the 1980s (Banerjee & Piketty, 2005; Chancel & Piketty, 2019; Deaton & Dreze, 2002; Kohli, 2012; Dev & Ravi, 2007; Milanovic, 2016).

Immediately after Indian independence in 1947, the state took ownership of the ‘commanding heights’ of the economy and ensured a progressive taxation structure with very high marginal rates for top incomes, with the explicit goal of curbing elite economic power and driving income convergence - indeed by the early 1970s the top effective marginal tax rate had risen to 97.5% (Banerjee & Piketty, 2005; Chancel & Piketty, 2019; Acharya, 2005). This period, until 1980, saw a sustained decline in income inequality, with the share of the top 10% of income earners reducing from 37% in 1951 to 31% in 1981, and that of the bottom 50% rising from 21% to 24% in the same period (Chancel & Piketty, 2019). This decline in inequality should however be contextualized by the fact that the poverty rate in India remained practically unchanged in this time – from 56% in 1954 to 53% in 1978 (Dutt & Ravallion, 2009). Essentially, low economic growth (3.4% per annum between 1951 and 1980) and high population growth (98% between 1951 and 1981) meant that even with the reallocation of income from the rich to the poor within the distribution, the poverty rate remained persistent at over 50% and the poverty head count doubled (Nagaraj R., 1990; Census of India, 2011; Dutt & Ravallion, 2009).

However, since 1980, there has been a progressive dismantling of the socialist architecture of the Indian economy, with enhanced private participation, deregulation of prices, and reduction in tax rates (the top marginal tax rate had declined to 30% in 1998) though still retaining a progressive taxation structure, which has resulted both in increased economic growth and rising income inequality (Banerjee & Piketty, 2005; Kohli, 2012; Chancel & Piketty, 2019; Rodrik & Subramanian, 2004; Basole, 2014). The share of the top 10% of income earners has sharply increased to 56%, and that of the bottom 50% has declined to 15%, as of 2015 (Chancel & Piketty, 2019). However, increased economic growth in the period from 1980 to 2015 (average annual growth rate of 6.05%) has also resulted in a significant decline in the poverty rate to 21%
in 2006 (Deaton & Dreze, 2002; Panagariya & More, 2014; Dhongde, 2007; Panagariya & Mukim, 2014; Dutt & Ravallion, 2009; Bhagwati & Panagariya, 2013).

It has been argued that although worsening inequality could be a consequence of economic growth (which yields poverty reduction), that the benefits of this growth are spread across the distribution in India, leaving individuals, on average, better off than before (Bhagwati & Panagariya, 2013). This interpretation is consistent with an income distribution where worsening income shares for those lower in the distribution occurs on account of differential income growths at different points in the distribution – essentially income growth is higher, on average, higher in the distribution, meaning that the lower end of such an income distribution would see lesser than average growth over time and account for a progressively reducing share of total income. In such a distribution, despite the rich benefiting more than the poor, everybody is better off than before. Recent work has revealed that while this was potentially the mechanism underlying increasing income inequality from 1980 to 2000, it is likely that the nature of redistribution has entered a fundamentally new regime since the early 2000s, where income growth at the bottom of the distribution has not just (on average) been lower, but negative, while incomes higher in the distribution experienced positive growth. This essentially implies that real incomes at the bottom of the distribution have actually been declining and that the income distribution is essentially diverging (Sahasranaman & Jensen, 2021).

In this work, we study the dynamics of income distribution and inequality in India from 2014 to 2019, with a particular focus on the bottom of the distribution. Using panel data from the Consumer Pyramids Household Survey (CPHS) to construct the Indian income distribution, we explore the evolution of income inequality for the country as a whole, as well as for the rural and urban India separately, to generate an understanding of distributional features and inequality. We also empirically examine inequality through the lenses of occupation and caste to identify the typology of India’s most economically vulnerable populations. Finally, in order to explore the dynamics operating at the very bottom of the distribution, we use a stochastic model to quantify: (i) the extent and direction of redistribution occurring in the distribution, and (ii) the likelihood of incomes at the bottom transitioning higher in the distribution over time.

2. Data and Methods
We use the data from the Consumer Pyramids Household Survey (CPHS) published by the Centre for Monitoring Indian Economy. The CPHS is a pan-India panel household survey of roughly 170,000 households collecting monthly data on income, consumption, demographics, assets and borrowing by households. The CPHS dataset creates a geographically representative dataset by sampling one or more Homogeneous Regions (HR) for each state from a set of neighbouring districts that have a similar agro-climatic condition, urbanisation levels, female literacy and family size as per the 2011 Census. The CPHS visits each household in the panel thrice a year (each visit is known as a “wave”), and all household-level is captured at monthly frequency. Using this data, we compute monthly per-capita income by adjusting the total household income reported for each month with the size of the households using a square root equivalence scale (Deaton A., 2003). We use household income as the basis to construct the Indian income distribution by adjusting each income by the appropriate weighting factor (provided by CPHS) to ensure appropriate representation of all household types in the income distribution; and then cumulate these adjusted incomes over each percentile to construct the income distribution. Annual income distributions are obtained by adding the corresponding percentiles in the 12 monthly income distributions.

An important consideration to keep in mind while analysing data from the CPHS survey is that the incomes at the top of the distribution are likely to be underestimated; this is a more general concern with income surveys where the highest incomes are unlikely to participate. More specifically in this context, we have the Indian income distribution from Chancel and Piketty (2019), who use tax data - a more reliable indicator of top incomes – to find that the income share of the top decile in 2015 was 56%, as against the 32.8% per CPHS data. Therefore, it is possible that the magnitude of income shares of the bottom half is overestimated in this analysis, which potentially makes the situation of the bottom decile of the distribution even more precarious than our findings indicate.

In past work the income share of the top 10% of income earners has been used as a metric for inequality (Chancel & Piketty, 2019), but given the concern expressed about underestimation of this component, we propose to use the ratio of income share of the bottom 50% ($S_{50\%}$) to that of the bottom decile ($S_{10\%}$): $S_{50\%}/S_{10\%}$. This metric focuses attention on the lowest part of the
distribution, and, more specifically, provides us a sense of the relative income earned by the bottom decile of the income distribution. A perfectly equal distribution would yield a ratio of 5.

Additionally, we also construct ventiles and deciles of the income distribution to explore the extent of income earned in different parts of the distribution. For each ventile/decile, we compute the average real income for each year from 2014 to 2019, adjusting for annual inflation using data from Reserve Bank of India’s Database on Indian economy (RBI, 2021). We compute the compounded average growth rate over the period 2014-19 to quantify the magnitude of real income growth at all points in the distribution and construct Growth Incidence Curves (GICs) for India (overall) and also for rural and urban India. We also construct the occupational and caste composition for each ventile, to enable an examination of these characteristics across the entire distribution.

Finally, in order to explore the nature of redistribution occurring in India for the period from 2014-19, we use a simple stochastic model of Geometric Brownian Motion with reallocation (RGBM) to model income dynamics (Berman, Peters, & Adamou, 2017). There is a body of empirical work which indicates that real world income, expenditure, and wealth distributions are reasonably approximated by lognormal distributions across many national contexts (Chatterjee, Chakrabarti, Ghosh, Chakraborti, & Nandi, 2016; Ghosh, Gangopadhyay, & Basu, 2011; Banerjee, Yakovenko, & Di Matteo, 2006; Drăgulescu & Yakovenko, 2001; Souma, 2001). RGBM models income growth as a multiplicative process described by Geometric Brownian Motion, yielding a widening lognormal distribution over time. However, given the context of real economies, where a number of mechanisms for redistribution are in place (such as taxes, transfers, and public spending), RGBM also incorporates a reallocation parameter ($\tau$) to capture the extent and direction of transfer occurring within the income distribution. Income dynamics in RGBM are described using the following stochastic differential equation:

$$dx_i = x_i(\mu dt + \sigma dW_i) - \tau(x_i - \langle x \rangle_N),$$  \hspace{1cm} (1)

where $dx_i$ is the change in income of $i$ over time $dt$, $\mu$ is the drift and $\sigma$ the volatility of income, $dW_i$ is a Wiener process increment with mean 0 and variance $dt$, $\tau$ is the reallocation parameter, and $\langle x \rangle_N$ is the mean income: $\langle x \rangle_N = \frac{1}{N} \sum_{i=1}^{n} x_i$. The first term of Eq. 1 is the income growth term encompassing growth due to both systemic ($\mu dt$) and idiosyncratic ($\sigma dW_i$) components,
and the second is the reallocation term, where the reallocation parameter ($\tau$) is applied to the net difference between individual $i$’s income and the average income of the society. If $\tau > 0$, it is indicative of progressive redistribution, where resources are being reallocated from the top to the bottom of the distribution, which is the reality we would expect in most modern societies; and if $\tau < 0$, over a period of time, the income distribution is divergent and redistribution is occurring from the bottom to the top of the distribution, indicative of a perverse state of economic inequity. $\tau$ is most appropriately understood as a cumulative measure of the overall redistribution occurring in an economy, implicit in the nation’s resultant income distribution.

In order to derive $\mu$ and $\sigma$ for the Indian income distribution, we use the previous work of Sahasranaman and Jensen (2021) as the basis for obtaining the values of parameters $\mu$ and $\sigma$ for the Indian income distribution. In that work, using time series data on the Indian income distribution (Chancel & Piketty, 2019), and time series of wholesale prices for staple Indian crops and commodities (rice, wheat, and jaggery) as well as short-term time series of wages, it was estimated that $\mu = 0.0231$ and $\sigma = 0.15$ for India’s income distribution. Given $\mu$ and $\sigma$, the RGBM algorithm is executed by propagating Eq. 1 over a set of $N$ incomes over $T = 5$ time periods (corresponding to the period from 2014 -19), such that at each time period, the reallocation parameter $\tau(t)$ is obtained by minimizing the distance between the income share of the bottom half of the simulated income distribution ($S_{50\%}^{model}(t)$) and that of the empirically observed Indian income distribution ($S_{50\%}(t)$). In summary, $\tau(t)$ is chosen to minimize $|S_{50\%}^{model}(t) - S_{50\%}(t)|$ at each time period $t$, resulting in a time series $\tau(t)$ that describes the temporal evolution of both the extent and direction of reallocation apparent in the income distribution. A detailed exposition on the RGBM algorithm is available in Berman, Peters, and Adamou (2017), and its application to the Indian income distribution for 1951-2015 in Sahasranaman and Jensen (2021).

Once the complete time series of income distributions is constructed using RGBM, we can study the transitions of incomes across the first decile so as to assess the persistence of low incomes over time. Specifically, we seek to understand how much a past in the lowest part of the distribution is a predictor of a present in this part of the distribution. Using methodology developed in Sahasranaman (2021), we define the persistence probability $p_{stic}(t, t_{D1})$ as the
probability of having spent at least $t_{D1}$ consecutive time periods in the bottom decile at time $t - 1$, given that the individual is in Decile 1 at time $t$ (Eq. 2):

$$p_{stic}(t, t_{D1}) = \frac{N_1(t|t_{D1})}{N_1(t)},$$

where, $N_1(t, t_{D1})$ is the number of individuals who have been in the first income decile for at least $t_{D1}$ years at time $t - 1$ and are still in the first decile at $t$; and $N_1(t)$ is the population of the first decile at $t$. This metric helps us understand how income dynamics impacts those who are deepest in poverty, and the extent to which escape from the lowest parts of the distribution is feasible.

3. Empirical examination of income distribution and inequality

We find that income inequality measured as $S_{50%}/S_{10%}$ increased from 13.4 in 2014 to 18.4 in 2019, but the rise is non-monotonic (Fig. 1a). There is a rise and a dip in 2015 and 2016 respectively, and this is followed by a consecutive rise till 2019, with a particularly sharp increase between 2018 and 2019. Overall, this means that the relative income of the poorest decile has decreased between 2014 and 2019, implying that there is relative compensatory increase in other parts of the distribution.

In order to develop a more nuanced understanding of this phenomenon, we explore the evolution of incomes of all deciles of population, and find that income shares of top 2 deciles declined from 51% to 49%, while the income share of each decile from the 3rd to the 9th decile showed an increase (Fig. 1b). Given this generally progressive trend, it is the bottom decile which emerges as a concern because it has lost income share in this period – from 1.6% to 1.2%, a decline of ~25% in this five-year period. This decline becomes even more pronounced the deeper we go into the income distribution, with the income share of the bottom 5% (first ventile) declining ~41%, from 0.27% in 2014 to 0.16% in 2019.

However, losses in income share over time are not necessarily representative of declines in real income levels; it is possible that certain parts of the income distribution gained share at the expense of others, but that all parts of the distributions experienced absolute increases in real income.
Figure 1: Evolution of the income distribution and Growth Incidence Curve 2014-19. A: Income inequality ($S_{50%}/S_{10%}$). Income inequality increases non-monotonically between 2014 and 2019. B: Evolution of income inequality as described the income share of deciles. Income shares of the top income deciles marginally decline and those in the middle increase. The income share of the bottom decile drops by 24.5%. C: Growth incidence curve (2014-19). The bottom ventile shows negative compounded annual real income growth rate, while the remaining ventiles show positive growth rates. Beyond the bottom two ventiles, annual growth rates, on average, decline towards the top of the distribution.

To test this, we construct the Growth Incidence Curve (GIC) of average real incomes by ventile for the period 2014-19 and find that the while top 95% of the distribution saw positive compounded annual real income growth from 2014-19, the bottom 5% had a decline in real income of -5.5% per annum in this time period (Fig. 1c). Our concerns about declining income shares at the bottom of the income distribution are exacerbated by this finding that a significant proportion of the lowest incomes experienced negative real income growth. The second ventile also shows an average real income growth of only 0.5%, suggesting that a portion of incomes in this ventile could also be subject to real income declines – indeed, when we analyse the percentiles comprising the second ventile (6th -10th percentiles), we find that both the 6th and 7th percentiles demonstrate real income declines as well at -7.3% and -3% respectively.

We now attempt to dig deeper into the composition of the bottom of the distribution, by splitting the Indian income distribution into its rural and urban income components.
4. Rural and urban dimensions of income inequality

As with the consolidated income distribution, we find that the \( k \)-index values for both the rural and urban distributions are between 0.64 – 0.65 for each year from 2014 to 2019, suggesting that the inequality in the distribution of income remained consistent in both distributions for this period. However, when we assess the change in income shares across parts of the distribution over time, we find that in the urban income distribution, the share of the bottom half increased from 22.8% to 24.4%, while the top half saw a decline in income share from 77.2% to 75.6% (Fig. 2b). Even the bottom decline saw an increase in income share by ~7%, from 2.5% to 2.7%. In the rural distribution, on the other hand, while we saw a decline in income share for the top decile (from 34.1% to 33.7%), the middle part of the distribution - from the 3rd to the 8th decile - experienced increase in income shares, and the bottom two deciles experienced significant declines (Fig. 2a). Overall, the bottom half of the rural income distribution saw a marginal decline in income share – from 22.7% to 22.1%, but within this, the income share of the bottom decile declined sharply by ~43%, from 1.3% to 0.76%. Given the low levels of income and low income share in this part of the distribution, this represents a drastic reduction. In view of these distinct dynamics in urban and rural distributions, the decline in income share of the bottom decile in the consolidated Indian income distribution appears to be driven primarily by the declines apparent in the rural distribution.
Figure 2: Rural and urban income distributions 2014-19. A: Income shares of deciles in rural income distribution. While the bottom deciles show loss in income share, the middle deciles show an increase in income share from 2014-19. B: Income share of deciles in urban income distribution. Bottom half of the distribution shows a gain in income share, while top half shows a slight decline. C: Ratio of average annual income per rural percentile to income per corresponding urban percentile in 2019. Rural incomes are, on average, much lower than urban incomes, and increasingly so as we go towards the bottom of the distribution. D: Growth incidence curves for rural and urban incomes. The bottom decile in the rural distribution shows negative annual income growth rate between 2014-19, but all other deciles show positive real growth. All deciles in the urban distribution register positive growth rates.

We find evidence of this when we compute the average annual income per percentile for both the rural and urban distributions – the average annual income of the first percentile of the consolidated Indian income distribution corresponds to second percentile of the rural distribution, and is much lower than first percentile of the urban. Indeed, the first ventile of the consolidated Indian income distribution, which we observe to exhibit negative income growth (Fig. 1c), is composed of the bottom 7 rural income percentiles and only part of the second urban income percentile. This confirms that negative income growth at the bottom of the Indian income distribution is essentially a rural phenomenon. The first decile of the consolidated distribution corresponds to the bottom 14 percentiles of the rural population and only the bottom 3 percentiles of the urban population. Indeed, average annual urban incomes are superior to rural incomes at all points in the distribution, as evinced by the ratio of average annual income of each percentile in the rural distribution to the corresponding urban percentile (Fig. 2c). This also cautions us against drawing too many inferences from relative performance of equivalent portions in the rural and urban distributions, given these vast discrepancies in income levels at corresponding points in the distribution.

We also examine the growth rates of real average income for each decile in the urban income distribution, and find that income growth rate is positive (and progressively declining) across the
deciles, pointing to a mildly convergent trend in the urban incomes, and consistent with an increase in income share for the bottom half of the distribution (Fig. 2d). However, while the top 9 deciles of the rural income distribution exhibit positive real growth, the bottom decile shows real income decline to the tune of -5% per annum (Fig. 2d). This result is in agreement with the negative real growth exhibited by the bottom ventile of the consolidated Indian income distribution (Fig. 1c), as the bottom ventile of the Indian distribution is comprised largely of incomes in the bottom 7 percentiles of the rural income distribution (Fig. 2c).

5. Occupation and caste at the bottom of the income distribution

We look into the data to assess the profiles of households at the bottom of the Indian income distribution and find that the bottom decile is comprised primarily of small and marginal farmers, organised farmers, and wage labourers – on average, 80% of the bottom decile is composed of households with these primary occupations from 2014-19 (Fig. 3a). Amongst these occupations, small and marginal farmers comprise the single largest occupational segment (~44%), followed by organised farmers (~23%), and then wage labourers (~13%) (Fig. 3a). These occupations, which have experienced declines in real income, therefore currently comprise the most economically vulnerable workers in the Indian income distribution. These findings are consistent with previous studies showing that incomes from casual and wage labour have an inequality reducing effect on the income distribution (Ranganathan, Tripathi, & Rajoriya, 2016; Shariff & Azam, 2009). Studying rural income inequality between 1993 and 2005, it was found that income from casual labour represented a source of decreasing inequality, meaning that a rise in labour incomes acted as a countervailing force to inequality because it represents the income of those at the bottom of the distribution (Shariff & Azam, 2009). Farm income and salaries, corresponding to higher parts of the rural income distribution, were found to be inequality enhancing sources of income. Analysis of IHDS data also found inequality decreasing effects of income from casual labour and remittances in 2011-12 (Ranganathan, Tripathi, & Rajoriya, 2016). The vulnerability of these occupations, especially of small and marginal farmers, has also been evinced in the growing incidence and extent of farmer indebtedness over time, as well as the tide of farmer suicides since the 1990s (Vakulabharanam & Motiram, 2011; Suri, 2006; Narayanamoorthy & Kalamkar, 2005; Vaidyanathan, 2006; Kennedy & King, 2014; Nagaraj, Sainath, Rukmani, & Gopinath, 2014). Overall, these outcomes from the 1990s and 2000s
combined with our findings for 2014-19, suggest that small and marginal farmers and wage labourers continue to comprise the most economically vulnerable populations in India, with their reducing share in the income distribution compounded by declining real incomes over time.

![Figure 3: Occupation and Caste in the income distribution](image)

Caste provides yet another salient stratification of the income distribution. Prior work on a small rural sample of 8 Indian villages revealed that Scheduled Caste (SC) households were substantially worse off than other communities, being over-represented in the bottom income quintile and under-represented in the top quintile (Rawal & Swaminathan, 2011). More worryingly, the study indicated that more prosperous villages were characterized by greater income inequality and caste segregation. Exploring the impact of caste on farm income per unit of cultivated land, it was found that SC and Scheduled Tribe (ST) owned land yielded significantly lower farm returns compared to other castes, and that this difference was substantially explained by caste-based inequality (Singh, 2011). SC households are also more likely to be in the lowest consumption quintile than households of other castes (Borooah, Diwakar, Mishra, Naik, & Sabharwal, 2014). Given this context, it is not surprising that SC and ST populations progressively decline as we go higher in the income distribution (Fig. 3b) – for 2014-19, SCs comprise 30% of the bottom income ventile, and only 8% of the top ventile, while
STs comprise 16% of the bottom ventile and only 2% of the top ventile. In contrast, we see that Upper Caste (UC) population fractions increase higher in the distribution – from 17% of the bottom ventile, UC population increases to 44% of the highest income ventile. The Other Backward Castes (OBCs) appear to be more evenly distributed across the income distribution, comprising 32 - 40% of each ventile, except for the top ventile where they account for only 24% of the population.

This finding highlights the fact that the most oppressed castes (SC and ST) occupy the most vulnerable occupations (small farmers and labourers) – yielding not just the lowest incomes in the distribution but also declines in real incomes for the period 2014-19. Of deeper concern is the fact the trend of declining real incomes in 2014-19 is likely part of a longer-term trend of income erosion experienced by these vulnerable castes and occupations since the early 2000s (Sahasranaman & Jensen, 2021).

6. Dynamics at the bottom of income distribution

The low, and declining, income shares of the bottom decile and the bottom ventile, as well as the decline in real income growth in this part of the distribution raise real concerns about the nature of reallocation occurring within the income distribution. Previous econometric modelling work indicates the possibility that the bottom of the income distribution in India has been witnessing negative growth since the early 2000s, and that the overall reallocation within the distribution has turned regressive – meaning that instead of the expected progressive redistribution from rich to poor in a modern regulated market economy, there is a regressive transfer of resources from the bottom of the distribution to the top (Sahasranaman & Jensen, 2021).

Using the RGBM, we model the evolution of the Indian income distribution from 2014 -19, and find reasonable concurrence between modelled results and empirical findings – Fig. 4a describes the modelled incomes for the bottom five deciles (dotted lines) and the corresponding empirical observations (solid lines). Incidentally, the model is able to reasonably simulate the evolution of even the top decile of the distribution, and given that the GBM produces a lognormal distribution, this concurrence supports the concern we had highlighted earlier that the CPHS data is not capturing the power law tail of the Indian income distribution. Given this correspondence between model and observation, we turn our attention to the time series of \( \tau(t) \), which describes
the time evolution of reallocation within the income distribution (Fig. 4b). \( \tau \) is declining from 2015 to 2018, indicating that the extent of reallocation within the distribution is reducing over time and re-distribution is becoming less progressive. Further, for the consolidated (and rural) income distribution, \( \tau \) turns negative in 2018 (’17 and ’18 for rural) highlighting the risk that continued negative reallocation in the future could result in persistent divergence in the income distribution, yielding a perverse reallocation of resources from the bottom of the distribution to the top. Indeed, the empirical observation of negative real income growth at the bottom of the consolidated and rural income distributions (Figs. 1c, 2d) is already in concurrence with the emergence of negative \( \tau \) in these distributions (Fig. 4b). While \( \tau \) does emerge positive in 2019 across all distributions, tracking the trend in \( \tau \) over a longer period of time will be required to ascertain whether the negative \( \tau \) regime is short-lived or not. Longer term perpetuation of negative \( \tau \) progressively increases the probability that income growth lower in the distribution turns persistently and deeply negative, calling into question extant policies of economic growth and redistribution in India.

\[ \begin{align*}
\text{Figure 4: Reallocation under RGBM:} \quad & \text{A: Income shares of bottom 5 deciles and top decile (RGBM model v. empirical). Dotted lines represent model outcomes and solid lines empirical data. The income distribution described the RGBM model bears close correspondence with empirical observation.} \\
& \text{B: Temporal evolution of } \tau(t). \text{ } \tau \text{ describes a declining trend across all distributions and even turns negative in for the consolidated and rural income distributions, before recovering to positive territory in 2019.}
\end{align*} \]

Given this temporal pathway of \( \tau \), we now turn to understanding how the dynamics impact those at the very bottom of the distribution, in terms of the difficulty involves in escaping from the
bottom decile to higher in the income distribution. Using Eq. 2, we study the persistence probabilities for $t_{D1} = 1$ and $t_{D1} = 5$ years, and find that incomes in the bottom decile display a high level of stickiness to that part of the distribution, with $p_{stic}(t, 1) = 0.84$ and $p_{stic}(t, 5) = 0.53$ (Fig. 5). This means that a past in deep poverty remains an effective predictor of future poverty – with an 84% chance that an individual who is in the bottom decile currently has been in the bottom decile for at least the past year, and a 53% chance that an individual who is currently in the bottom decile has been in the bottom decile for at least the past 5 years. We do not see much of a difference when we compute these probabilities across rural and urban income distributions, though the bottom incomes in the urban distribution exhibit marginally lower stickiness than rural incomes (Fig. 5). Effectively, we see that for individuals low in the income distribution, escape seems an unlikely prospect. Our empirical analysis reveals that these are the incomes also declining over time, which makes their economic existence truly perilous.

![Figure 5: Persistence probabilities](image)

*Figure 5: Persistence probabilities:* Persistence probabilities $p_{stic}(t, 1)$ and $p_{stic}(t, 5)$ for the overall Indian (black), Indian urban (green) and Indian rural (blue) income distributions. A past in deep poverty appears to be a meaningful predictor of current deep poverty.

Previous work has demonstrated that India was likely in a prolonged, decade-long period of negative reallocation beginning in 2002, with a significant proportion of the population at the bottom of the income distribution experiencing negative income growth (Sahasranaman & Jensen, 2021). The growing informalization of the formal workforce in manufacturing and services as well as rising agrarian distress have meant that employment is increasingly
characterized by greater insecurity and uncertainty (Vakulabhanam & Motiram, 2011; Vaidyanathan, 2006; Suri, 2006; Mehrotra, 2019). Our work here also uncovers the caste and occupational dimensions of those at the bottom of the income distribution, highlighting the concern that SC and ST populations engaged in small-hold farming and wage labour have experienced a process of deepening povertization over the last two decades. This process, combined with dynamics which reveal that the incomes of the poorest in the income distribution also exhibit very high likelihoods of remaining in the bottom decile over time, are cause for alarm going into the future as well. Providing income support for the bottom deciles in the Indian income distribution is therefore a clear and present policy concern.

7. Conclusion

We study the income distribution for India from 2014 to 2019 and find that income shares at the very bottom of the distribution decline substantially. Income shares of the bottom decile and ventile decline by 25% (from 1.6% to 1.2%) and 41% (from 0.27% to 0.16%) respectively. Using Growth Incidence Curves for 2014-19, we find that not only do the income shares at the bottom of the distribution decline, but that real income growth is negative - the bottom ventile has an annual growth rate of -5.5% and the subsequent percentiles (6th and 7th) also exhibit negative growth.

In order to understand the composition of the bottom of the income distribution, we explore rural-urban splits of income distribution, and find that while the bottom decile of the urban distribution gains income share from 2.5% to 2.7%, the bottom two deciles of the rural distribution see significant declines, with the income share of the bottom decile declining sharply by 43%, from 1.3% to 0.76%. We also find that the Growth Incidence Curves for the urban and rural distributions reveal that while all deciles in the urban distribution experienced positive real income growth from 2014-19, the bottom decile of the rural distribution experienced negative real income growth for this period, at -5% per annum. The bottom ventile of the composite Indian distribution which experienced negative income growth is therefore composed largely of rural incomes. We validate this empirically and find that the bottom ventile of the composite distribution is composed of the first 7 rural percentiles of rural incomes and only part of the second percentile of urban incomes, thus confirming that negative income growth is essentially a rural phenomenon.
Using household data for each percentile, we find that the bottom decile of the Indian income distribution is comprised largely of small, marginal, and organised farmers as well as agricultural and wage labour, and also that these occupations are performed predominantly by Scheduled Castes (SC) and Scheduled Tribes (ST), whose participation in the workforce is maximised at the bottom of the income distribution. Taken together, we can confirm that the lowest incomes in India today are comprised predominantly of SC and ST populations, working in the most economically precarious occupations and suffering from the double whammy of declining income shares and real income declines. We also highlight the possibility that these groups have been in a negative growth spiral since the early 2000s.

In order to assess the redistribution occurring within the income distribution, we use the RGBM model to quantify the nature and extent of reallocation inherent in the income distribution. We find that reallocation rates are declining in all distributions (consolidated, rural, and urban) from 2015 to 2018, and are even negative for the consolidated (in 2018) and rural (2017 and 2018) distributions. This means that the extent of redistribution is decreasing continuously but decline into negative \( \tau \) indicates the potential risks of continued negative reallocation – regressive redistribution of resources from the bottom to the top of the distribution. We also find that a past in the bottom of the income distribution is a good predictor of a present in that part of the distribution. This dynamic, combined with our evidence of negative real income growth at the bottom of Indian income distribution makes for a worrying prognosis of the future.

This fragility of incomes lower in the distribution is reflective of broader economic trends including informalization of the formal workforce and agrarian distress. The design of sustained income support policies for marginal farmers and wage labourers is therefore an area that requires immediate attention.

**Conflict of Interest statement:** The authors declare no conflict of interest.

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