Growth, Structural Change, and Poverty Reduction: Evidence from India

Sen Gupta, Abhijit and Hasan, Rana and Lamba, Sneha

April 2014

Growth, Structural Change, and Poverty Reduction: Evidence from India[1]

Rana Hasan[2], Sneha Lamba[3], and Abhijit Sen Gupta[4]

We examine the relationship between growth in labor productivity and poverty reduction through the lens of changes in the structure of output and employment. Combining state-level data from India on poverty with state-level data on output and employment for 11 production sectors over 1987–2009, we find that the movement of workers from lower to higher productivity sector is an important channel through which increases in aggregate productivity translate into poverty reduction. We also find that the importance of this channel of productivity growth, termed structural change by recent literature, varies across states. Exploratory analysis reveals that indicators of financial development, business regulations that promote competition and flexible labor regulations are associated with larger reallocations of labor from lower to higher productivity sectors. Overall, our findings are consistent with the view that a better investment climate is not only good for business, it is also an important means for making growth more pro-poor in a labor abundant country.

[1] This paper was originally published as ADB South Asia Working Paper. The views expressed in this paper are those of the author and do not necessarily reflect the views and policies of the Asian Development Bank (ADB) or its Board of Governors or the governments they represent.
[2] Rana Hasan is Principal Economist at the India Resident Mission, Asian Development Bank.
[3] Sneha Lamba is Graduate Student, Barcelona Graduate School of Economics, Universitat Pompeu Fabra, Barcelona, Spain.
[4] Abhijit Sen Gupta is Senior Economics Officer at the India Resident Mission, Asian Development Bank

I. INTRODUCTION

1. After 3 decades of generally low growth, the Indian economy experienced a growth acceleration that started in the 1980s. Growth in gross domestic product (GDP) per capita, only 1.4% annually from the 1950s through 1970s, accelerated steadily—from average annual growth rates of 3.5% in the 1980s, to 3.7% in the 1990s, and 5.5% in the new millennium. While a slowdown in growth since early 2011 has led to a vigorous debate about the Indian economy's "growth potential" and its ability to sustain growth rates of around 6% and higher (in per capita terms) for long stretches of time, a more enduring debate has been about the inclusiveness of India's growth.

2. What has been the impact of India's growth on poverty? What factors explain the strength of the growth–poverty relationship in India? What, if anything, can be done to make the growth process more effective in reducing poverty? This paper examines these questions through the lens of structural transformation—i.e., changes in an economy's structure of output and employment.[5] Such an approach is important since, although there are many causes of poverty, ultimately the poor are poor because the work they do earns them so little. Consequently, understanding the relationships between growth, changes in the structure of output and employment, and poverty reduction is crucial for policymaking.

3. The paper is organized as follows. Section 2 starts by providing a snapshot of the empirical relationship between economic growth and poverty reduction in India since the 1980s. (A detailed discussion of data and variable construction is provided in the Appendix.) The snapshot indicates that while growth in India has been associated with an unambiguous decline in poverty, the extent of poverty reduction in India has been considerably less than in other high-growth economies in Asia. The section then considers the proximate factors that can explain the relatively weak link between growth and poverty reduction in India. Drawing upon previous literature and some simple analysis of the evolving sectoral composition of output and employment in India, it is noted that the impact of growth on poverty is influenced by which production sectors drive growth. This is because in India, as is the case in developing countries more generally, sectors differ vastly in terms of their (labor) productivity.[6] Of course, sectors also differ in terms of how many people they employ. Since productivity influences earnings, differential performance of sectors in terms of growth in output and productivity will have important implications for workers' earnings and thus poverty.[7] In general, growth will have a larger impact on poverty when the former is driven by increases in productivity in sectors that employ a large proportion of an economy's workers. However, growth can also be driven by a reallocation of workers from low productivity (and low earning) sectors to higher productivity (higher earning) sectors.[8] Growth that is driven by such a reallocation can also be expected to reduce poverty.

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[5] Structural transformation in an economy is usually thought to encompass three processes: (i) changes in sectoral composition of output; (ii) changes in sectoral composition of employment; and (iii) changes in the rural–urban composition of output and employment. Our focus in this paper is on the first two processes only.

[6] McMillan and Rodrik, 2011.

[7] Increases in productivity may also lead to a reduction in the price of output. In this case, the relationship between productivity and poverty would run through the gains the poor experience as consumers of a product whose (relative) price is falling. Of course, the significance of this effect will depend on the importance of the product in the consumption basket of the poor.

[8] McMillan and Rodrik, 2011.

4. Section 3 uses state-level data on poverty and productivity across 11 broad sectors of production from 1987 to 2009 to explore the impact of aggregate labor productivity growth and

its components—within-sector productivity growth and productivity growth due to reallocation of labor—on poverty reduction.[9] A key finding is that the movement of workers from lower productivity to higher productivity sectors is an important channel through which increases in productivity translate into poverty reduction. Significantly, the relative importance of this phenomena—which we call structural change[10] and which should be distinguished from the broader concept of structural transformation—varies across states.

5. Some exploratory regression analysis indicates that the extent of structural change responds to policies and the institutional environment. In particular, states with better functioning credit markets and pro-competitive regulations are more likely to see greater reallocation of labor from lower productivity to higher productivity sectors. Section 4 concludes with a discussion of the policy implications of the findings, including what types of policy changes may be needed for growth to have a bigger impact on poverty reduction.

II. GROWTH AND POVERTY REDUCTION IN INDIA

6. After 3 decades of low and volatile growth, India experienced an acceleration in economic growth in the 1980s.[11] As Figure 1 shows, prior to the 1980s, growth in GDP per capita (in terms of 5-year moving averages) tended to fluctuate between 1% and 2%.[12] However, growth rates started increasing in the early 1980s and continued to do so well into the 2000s. Thus, while GDP per capita grew by an average of around 1.2% annually in the 1960s and 1970s, each subsequent decade has seen a steady climb in growth rates—from average annual growth rates of 3.5% in the 1980s, to 3.7% in the 1990s, to 5.5% in the new millennium. Table 1 shows that India's growth acceleration has put it among the fastest-growing economies in
the world.'

7. Viewed from the lens of poverty and household expenditure data (on which computations of poverty in India are based), growth in India has been inclusive. As Figure 2 indicates, poverty rates in India have declined for a variety of poverty lines, national and international. The insensitivity of trends in poverty to different poverty lines is not surprising when we consider that per capita expenditures adjusted for both temporal and spatial price differentials have increased for every statistical percentile group of individuals in India (Figure 3). Thus, regardless of the poverty line used, it is clear that the proportion of people living in

[9] Our state-level analysis is based on data from 15 major Indian states using pre-2000 boundaries of three large states: Andhra Pradesh, Assam, Bihar (including what is now Jharkhand), Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh (including what is now Chhattisgarh), Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh (including what is now Uttarakhand) and West Bengal.

[10] Following the terminology of McMillan and Rodrik (2011).

[11] The exact timing of India's growth acceleration and its causes are the subject of debate. For example, while Rodrik and Subramaniam (2005) have emphasized the role of "pro-business" reforms of the early 1980s, and thus downplayed the importance of the dramatic trade liberalization and industrial policy delicensing that took place in 1991, Panagariya (2008) has argued that unsustainable increases in public expenditures and foreign borrowings were important drivers of growth in the 1980s, and thus that without the reforms of 1991, India's growth acceleration of the 1980s would have proved to be short-lived.

[12] The figure considers a five-year moving average of annual growth rates of GDP per capita since there is a lot of year-to-year fluctuation in growth rates, particularly in the earlier years when India's economy was especially influenced by the often fickle monsoons.

poverty has been declining. Indeed, the data indicate that even the number of extremely poor in India has begun to decline since the mid-2000s (or even mid-1990s, depending on the particular poverty line used). Thus, while the number of poor (based on the Expert Group 2009 poverty lines) increased marginally from 403.7 million in 1993–1994 to 407.2 million in 2004–05, the number of poor had fallen to 354.7 million in 2009–2010.[13] This is in sharp contrast to the situation in the 1950s and 1960s when the number of poor was expanding rapidly in India (in terms of a variant of the national poverty line used by Datt and Ravallion).[14] Based on this alternative poverty line, the number of poor only began declining after some point in the mid-1990s.

Figure 1: India's Growth Performance: Five-Year Moving Averages of Gross Domestic Product per Capita, 1951–1952 to 2011–2012

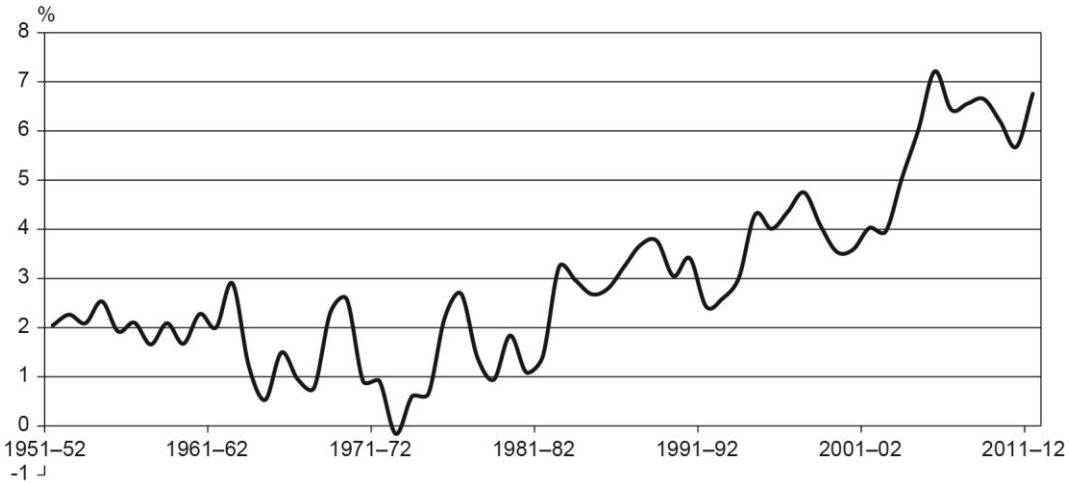


Table 1: International Comparison of Economic Growth

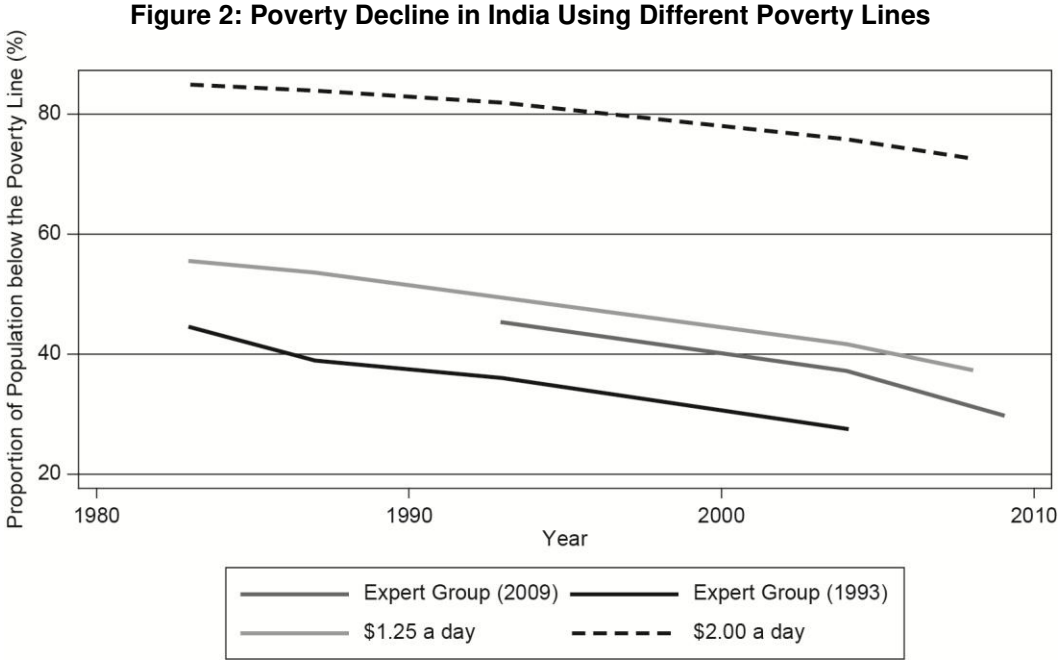
Region	Period	GDP	GDP per Worker
India	1960–1980	3.4	1.3
	1980–2004	5.8	3.7
PRC	1960–1980	4.0	1.8
	1980–2003	9.5	7.8
South Asia	1960–1980	3.6	1.4
	1980–2003	5.5	3.4
East Asia less PRC	1960–1980	7.0	4.0
	1980–2003	6.1	3.7
Latin America	1960–1980	5.7	2.7
	1980–2003	2.0	–0.6
Africa	1960–1980	4.4	1.9
	1980–2003	2.2	–0.6
Middle East	1960–1980	5.4	3.2
	1980–2003	3.8	0.8
Industrial Countries	1960–1980	4.2	2.9
	1980–2003	2.6	1.6

[13] Press Note on Poverty Estimates, 2009-2010, Planning Commission, Government of India, March 2012.

[14] Datt and Ravallion, 2011.

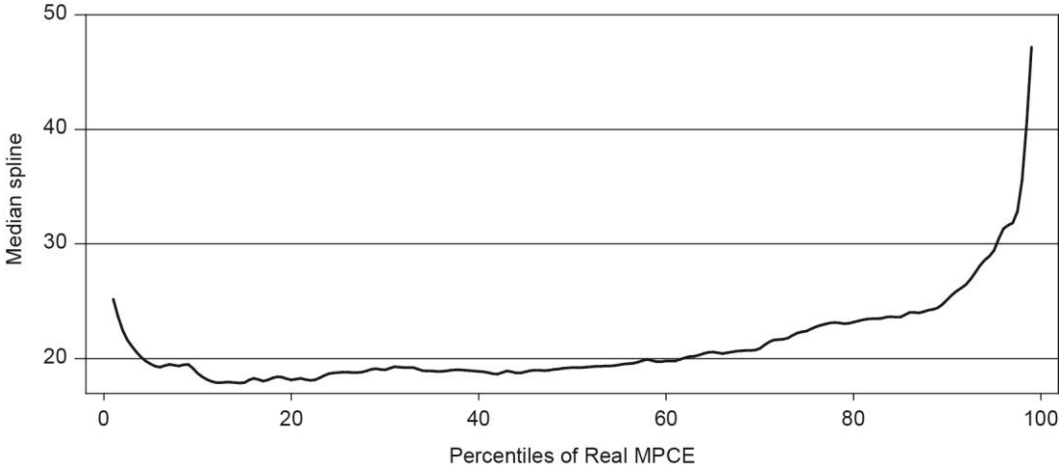
Notes: The independent variables are in annualized rate of change terms. Specifications (1)–(3) estimate the coefficient for all the time periods under consideration, i.e. the periods 1987–1993, 1993–2004 and 2004–2009, while specifications (4)–(6) estimates coefficients for only post-liberalization years, i.e., the time periods 1993–2004 and 2004–2009. All values are in annualized percentage terms. t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Bosworth, Collins, and Virmani (2007).

Figure 2: Poverty Decline in India Using Different Poverty Lines



Source: Government of India (2012) and PovcalNet.

Figure 3: Growth in Per Capita Expenditures by Percentiles of the Population, 1993–1994 to 2009–2010

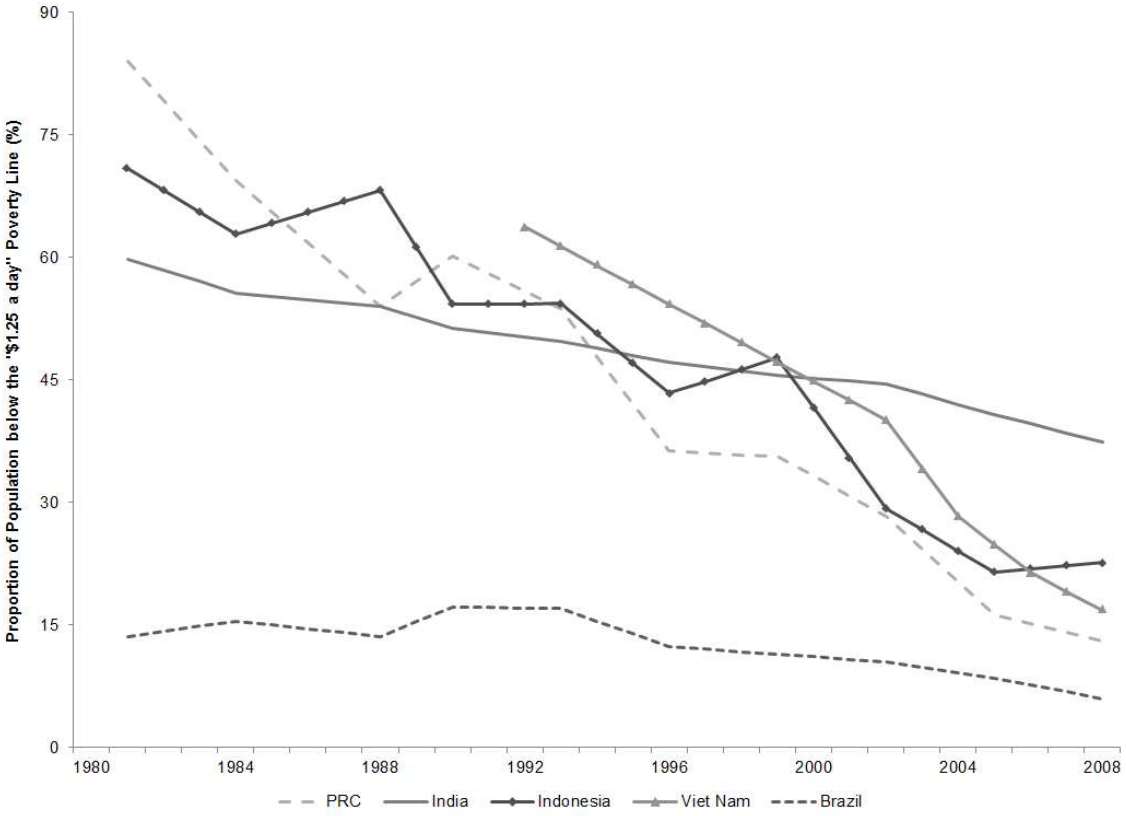


Note: Computed using Uniform Recall Period monthly per capita expenditure from the National Sample Survey Organisation's Consumer Expenditure Survey data and adjusting expenditures for spatial and inter-temporal differences in prices using the implicit consumer price index generated from the Expert Group (2009) poverty lines.
Source: Authors' estimates.

8. The pace of poverty reduction has, however, been relatively slow in India. As Figure 4 shows, India's pace of poverty reduction has been clearly slower than that of the People's Republic of China (PRC), Indonesia, and Viet Nam. Interestingly, differentials in GDP growth

rates do not explain the differential performance in poverty reduction. Consider the following elasticities of poverty reduction to GDP growth reported by Ravallion,[15] –0.8 for PRC (1981–2005) and –0.3 for India (1993–2005). These numbers tell us that for a 1% increase in GDP in PRC, there was a 0.8% reduction in the poverty rate. In India, on the other hand, the poverty rate declined by only 0.3% for every 1% increase in GDP. Since actual growth in PRC was also much higher than in India, the net effect of growth on poverty was that much greater.

Figure 4: Poverty Reduction in India as Compared to Selected Economies



Note: Poverty Head Count Ratios are based on the "$ 1.25 a day" at 2005 Purchasing Power Parity poverty lines.
Source: Computed using PovcalNet, the online tool for poverty measurement developed by the Development Research Group of the World Bank.

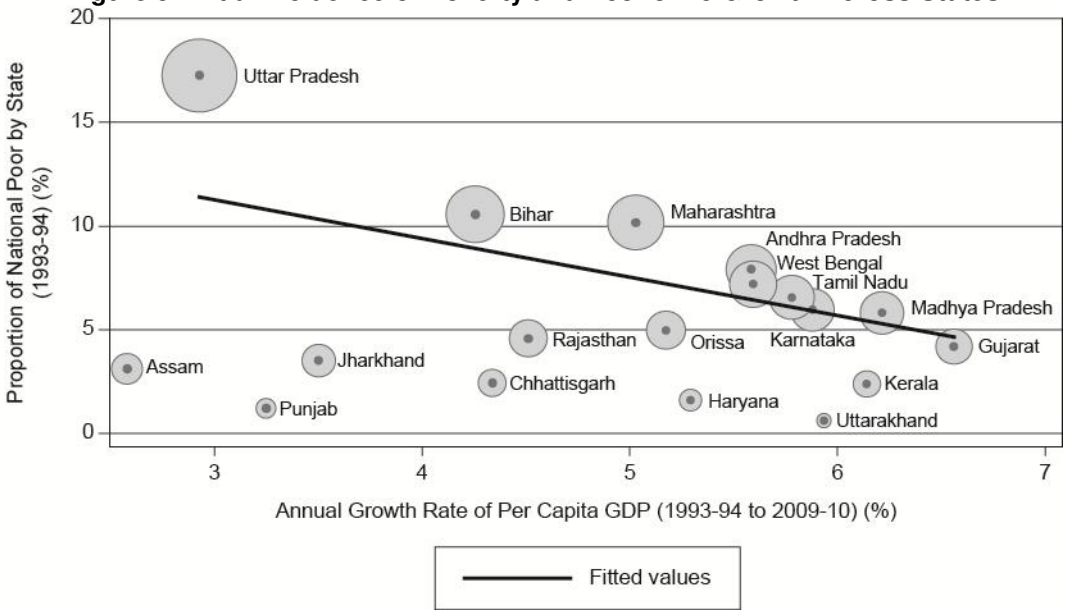
9. Significantly, Datt and Ravallion's analysis of the growth–poverty relationship in India from 1951 to 2006 indicates that the pace of poverty reduction failed to picked up after the reforms of 1991 (although it must be noted that more recently released data reveal that the pace of poverty reduction has distinctly picked up between 2004 and 2009).[16] Since economic growth has been faster in the post-1991 period, the elasticity of poverty reduction to growth in GDP, in fact, declined a little if data until 2006 are considered.

10. Why has growth in India not led to faster poverty reduction? There are several proximate factors that can explain the relatively weak link between growth and poverty reduction in India. First, India's 'initial conditions' in terms of human development—encompassing nutritional, health, and educational status—have been weaker. Given the findings of Datt and Ravallion that

[15] Ravallion, 2009.
[16] Datt and Ravallion, 2011.

Indian states with better initial levels of human development had higher growth elasticities of poverty reduction, the growth-poverty linkage in India might be weaker on account of its more limited progress on the nutrition, health, and education front as compared to many East and Southeast Asian countries.[17] Second, growth has tended to be lower in states that account for a large proportion of India's poor. As Figure 5 shows, among Indian states that accounted for more than 3.5% each of India's total poor in 1993, there has been a clear tendency for states with greater numbers of poor to grow more slowly from 1993 to 2009. Similarly, growth in rural India, which has accounted for between 81.5% and 78% of India's poor over 1993 and 2009, has been considerably slower than growth in urban India. Estimates from the High Powered Expert Committee (HPEC) indicate that the faster growth of urban areas has resulted in their contribution to GDP increasing from 51.7% in 1999–2000 to around 62% in 2009–2010.[18] Interestingly, however, this differential growth between rural and urban areas may not have as strong a role in explaining the relatively weak growth–poverty relationship post-1991 as it had prior to 1991. Datt and Ravallion find that, whereas rural economic growth was more important than urban economic growth for overall poverty reduction, urban economic growth has begun having a significant impact on poverty reduction in the post-1991 period.[19]

Figure 5: Initial Incidence of Poverty and Economic Growth Across States



Notes: The fitted line is based on states with more than 3.5% of India's total poor in 1993–1994.
Source: Authors' estimates.

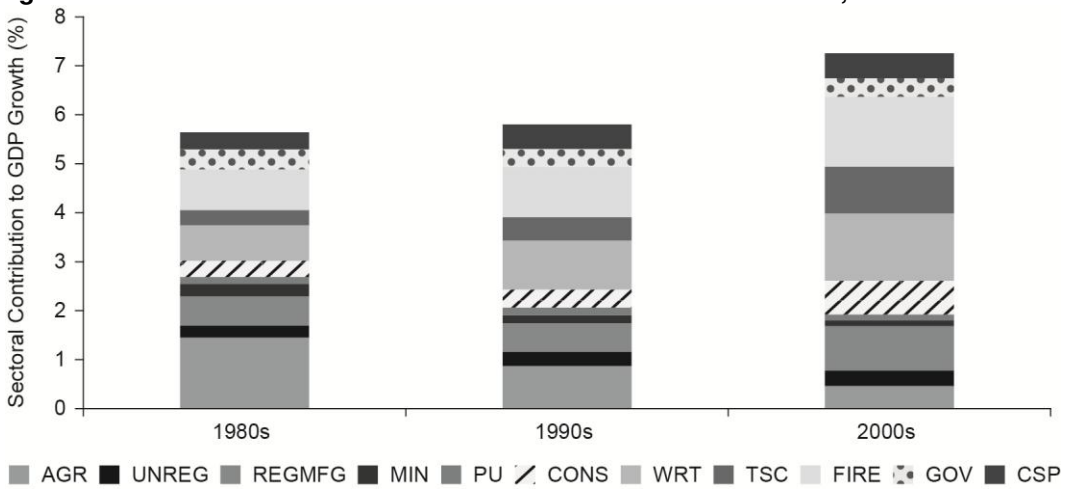
11. Finally, and perhaps more importantly, the sectoral composition of India's growth seems to have been such that it has generated relatively fewer productive employment opportunities for the poor. Consider Figure 6**,** which describes the sectoral contribution to GDP growth in India from 1980 to 2011. Three features are apparent. First, the contribution of agriculture to aggregate growth has been declining over time. Second, the main driver of growth in India has been service industries such as finance, insurance, and real estate; transport services and communications; and wholesale and retail trade. Third, while growth in manufacturing (and construction) has also played an important role, this has been on account of

[17] Datt and Ravallion, 1999.
[18] HPEC, 2011.
[19] Datt and Ravallion, 2011.

the registered or formal manufacturing sector; the contribution of unregistered or informal manufacturing sector to growth has been low and unchanged over time.

12. In and of itself, the first of these features is not problematic. Indeed, it is natural for agriculture's contribution to growth to decline as an economy develops. The problem comes in when we recognize that the structure of employment in India has changed far less than the structure of output. In particular, the share of agriculture in total employment declined from 68% in 1983 to 51% in 2009. Given that the share of agriculture in total output declined from 37.1% to 14.7% over the same period, the implication is that far too many of India's workers have remained in a sector that has displayed insufficient productivity growth.[20] Similarly, while the rapid growth of services relative to industry or manufacturing is also not problematic per se (though it does go against the pattern experienced by high-performing East Asian economies that have also been very successful in poverty reduction), the lackluster growth of India's unregistered manufacturing sector—which employs around 80% of manufacturing workers and tends to be very labor intensive in contrast to the skill- and/or capital-intensive registered manufacturing sector—is. In particular, it suggests that employment opportunities in a nonagricultural sector (widely believed to have considerable potential for absorbing less skilled workers at higher productivity than agriculture) expanded at a slow pace.[21]

Figure 6: Sectoral Contribution to Gross Domestic Product Growth, Selected Periods



AGR = Agriculture and Allied Activities, CONS = Construction, CSP = Community, Social and Personal Services, FIRE = Finance, Insurance and Real Estate, GOV = Public Administration; Government Services, MIN = Mining and

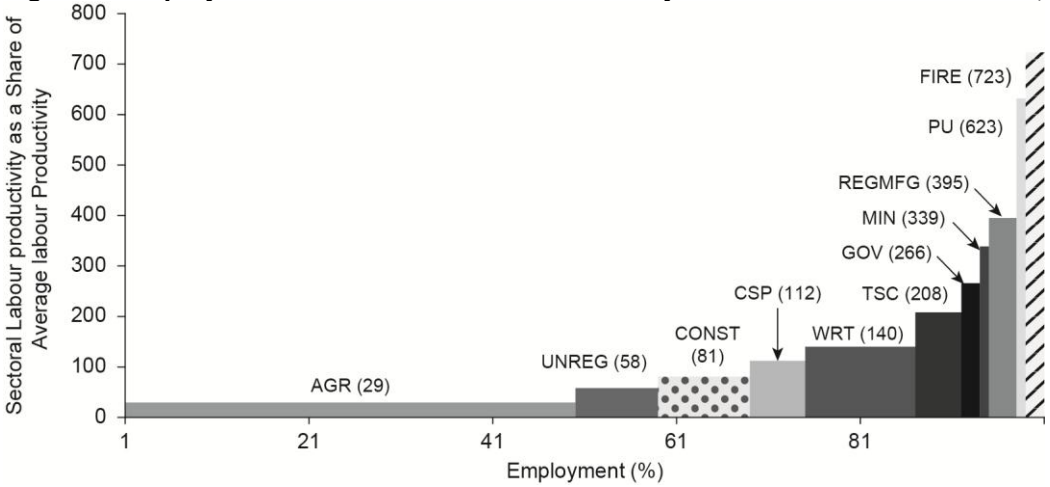
[20] Papola and Sahu, 2012.

[21] Using data on Indian poverty and production from 1951 to 1991, Ravallion and Datt (1996) find output growth in the primary and tertiary sectors to be poverty reducing. Growth in the secondary sector is found to have no impact on poverty reduction. These patterns show up both in the aggregate as well as for rural and urban India, separately. A consistent set of results is obtained by Hasan, Quibria, and Kim (2003) who use cross-country data and find that poverty reduction in South Asia has been more closely associated with growth in the primary and tertiary sectors—unlike the case of East Asia where the growth in the secondary sector has been an important driver of poverty reduction. Both findings are consistent with the point being made here. That is, while India's manufacturing sector grew, its expansion was driven by the skill-and/or capital-intensive registered manufacturing sector. The labor-intensive unregistered manufacturing sector experienced limited growth. Since the fortunes of the poor are likely to be more intimately linked with the performance of unregistered manufacturing given the dualism in Indian manufacturing, it would not be surprising to find that growth in manufacturing, driven by an expansion of registered manufacturing, to not be particularly poverty reducing.

Quarrying, PU = Public Utilities, REG = Registered Manufacturing, TSC = Transport, Storage and Communications, UNREG = Unregistered Manufacturing, and WRT = Wholesale and Retail Trade, Restaurants and Hotels.
Notes: Computed using national accounts data from the Central Statistical Organisation. GDP and sectoral growth rates are averages over the 10-year period reported.
Source: Authors' Estimates.

13. Put differently, India's changing structure of production, characterized by the declining importance of agriculture, would have been more poverty reducing had it been accompanied by larger increases in agricultural productivity and larger changes in the structure of employment with labor moving out of agriculture to higher productivity sectors.[22] Figure 7, which uses India-wide data from 2009 to describe how India's workers are distributed across sectors along with the levels of sectoral labor productivity (relative to the national average), shows this quite clearly.[23] As may be seen, around half of India's workers are engaged in the agriculture sector. Given the extremely low productivity of the sector—only 29% of average productivity nationally—the implication is that a near majority of India's workers are trapped in a vicious cycle of low productivity and low earnings. For growth to be associated with rapid poverty reduction, India would have to raise productivity in the agriculture sector on the one hand, and ensure that job opportunities come up in higher productivity sectors elsewhere.

Figure 7: Employment Shares and Labor Productivity Differentials across Sectors,



AGR = Agriculture and Allied Activities, CONST = Construction, CSP = Community, Social and Personal Services, FIRE = Finance, Insurance and Real Estate, GOV = Public Administration; Government Services, MIN = Mining and Quarrying, PU = Public Utilities, REGMFG = Registered Manufacturing, TSC = Transport, Storage and Communications, UNREG = Unregistered Manufacturing, and WRT = Wholesale and Retail Trade, Restaurants and Hotels.
Source: Authors' estimates based on Central Statistical Organisation and National Sample Survey Organization reports.

14. Which sectors will these be? As Figure 7 reveals, there are certainly sectors in which productivity levels are very high. The difficulty is that many of these sectors—such as finance,

[22] In their analysis of the effects of agricultural productivity on poverty in India, Datt and Ravallion (1998) find increases in agricultural productivity to be associated with lower poverty through several channels including higher yields, an expansion of employment opportunities, increases in wages, and/or declines in relative food prices.

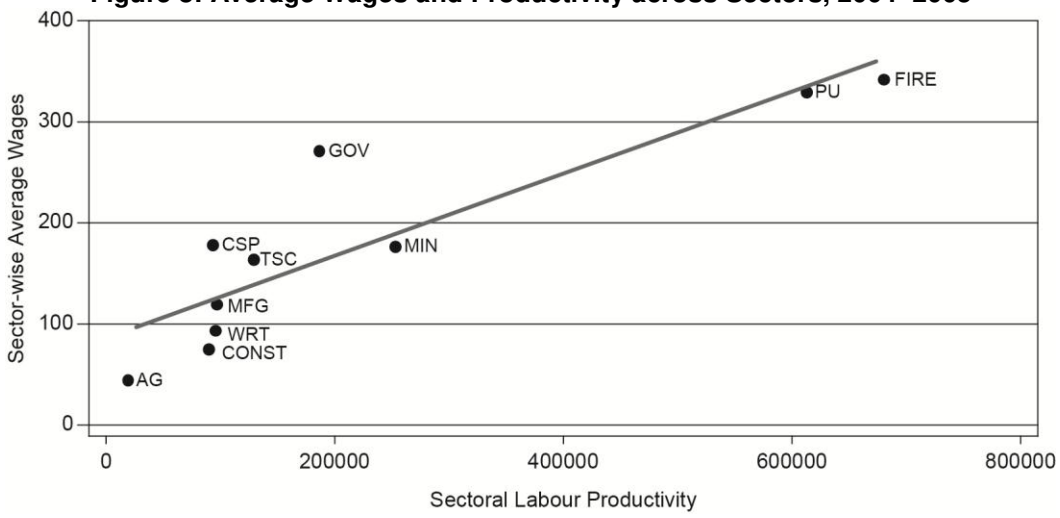
[23] Output data is from the Central Statistical Organisation (CSO) while employment data is drawn from the employment-unemployment surveys of the National Sample Survey Organisation (NSSO). Information on usual principal status of individuals is used for determining employment across states and industries.

insurance, and real estate; mining; and public utilities—have low potential for generating jobs on a large scale for semiskilled workers. One sector with considerable untapped potential for generating reasonably high productivity jobs is manufacturing. Unfortunately, employment in this sector has been fairly stable at around 12%–15%. The policy reasons behind India's pattern of growth in output and employment, and thus the relationship between growth and poverty, is something we will come back to later in this paper.

III. PRODUCTIVITY GROWTH, STRUCTURAL CHANGE, AND POVERTY REDUCTION

15. The foregoing discussion suggests that the impact of aggregate growth on poverty depends on the sectoral composition of growth for two reasons. First, production sectors differ vastly in terms of their productivity. Since earnings are influenced by productivity, this differential has implications for cross-sector earnings. Indeed, as Figure 8 shows, average wages tend to be higher (lower) in sectors with higher (lower) productivity.[24] Second, employment shares vary considerably across sectors. The implication is that differential performance of sectors should have implications for the extent of new employment opportunities generated, earnings, and thus poverty.

Figure 8: Average Wages and Productivity across Sectors, 2004–2005



Notes: Average daily wages and annual labor productivity are expressed in nominal 2004–2005 rupees.
AGR = Agriculture and Allied Activities; CONST = Construction; CSP = Community, Social and Personal Services; FIRE = Finance, Insurance and Real Estate; GOV = Public Administration, Government Services; MFG = Manufacturing; MIN = Mining and Quarrying; PU = Public Utilities; REGMFG = Registered Manufacturing; TSC = Transport, Storage and Communications; and WRT = Wholesale and Retail Trade, Restaurants and Hotels.
Source: Authors' estimates based on National Sample Survey Organisation reports

16. An implication of Figure 7 is that increases in aggregate growth need not stem only from improvements in productivity within a given production sector; they can also arise from a

[24] Our measure of average wages is derived from the NSSO's employment-unemployment survey of 2004–2005 for the 15 major states. In particular, we took data on weekly earnings and number of half days worked (over a 7-day period) by regular and casual wage employees to calculate daily wages for workers. These were averaged over each of the production sectors we work with in this paper. However, as the survey data does not allow us to distinguish between unregistered and registered manufacturing, we consider a single, consolidated manufacturing sector for computing both average wages as well as average labor productivity by sector.

reallocation of resources, especially employment, from lower productivity to higher productivity sectors.[25] In fact, in their analysis of productivity growth and its drivers in developing countries from around the world, McMillan and Rodrik note an important feature that distinguishes the experience of Asia, the region with the highest increases in aggregate productivity, from Africa and Latin America. While all three regions have experienced increases in within-sector productivity, it is mainly in Asia that these have additionally been accompanied by a reallocation of employment from lower productivity to higher productivity sectors. The result has been fairly high increases in aggregate productivity. In contrast, in Africa and Latin America, employment changes toward higher productivity sectors have been minor (or even actually moved to lower productivity sectors). One reason for this is that the expansion of aggregate output and productivity in Latin America and Africa has been often driven by increases in productivity within highly capital-intensive sectors (for example, mining).

17. The implications for poverty reduction follow quite clearly. Growth will have a larger impact on poverty when it is driven by sectors that employ a large proportion of an economy's rank and file workers (such as agriculture). However, growth can also be driven by a reallocation of workers from low productivity (and low earnings) sectors to higher productivity (higher earnings) sectors. Growth that is driven by such a reallocation should also be poverty reducing.

18. In what follows, we use data on poverty, employment, and productivity for 15 states (based on pre-2000 state definitions, as noted earlier, and spanning 1987–2009) to explore how aggregate (labor) productivity, the proximate driver of economic growth, affects poverty. Following the work of McMillan and Rodrik, we break down states' aggregate productivity growth into two components: within-sector productivity growth and that due to structural change or reallocation of labor. The relationships are captured by the following equation:

$$\Delta Y_t = \sum_{i=n} \emptyset_{i,t-k} \Delta y_{i,t} + \sum_{i=n} y_{i,t} \Delta \emptyset_{i,t} \quad (1)$$

where ΔY_t is the change in productivity at the economy wide level. The first term on the right hand side of the equation reflects the weighted sum of productivity growth within the individual production sectors, with the weights, $\emptyset_{i,t-k}$, being the share of employment at the beginning of the period. The second term indicates the change in labor productivity due to reallocation of employment across sectors. McMillan and Rodrik refer to this term as 'structural change'.[26]

A. Productivity Growth across States

19. We first examine how productivity and its two components have evolved across India's major states from 1987 to 2009. The bars of Figure 9 present the productivity growth numbers expressed in annualized growth rates.[27] The numbers above the bar denote the ranking of states in terms of how important structural change has been as a driver of growth. As may be seen from the figure, both within-sector productivity growth and structural change have

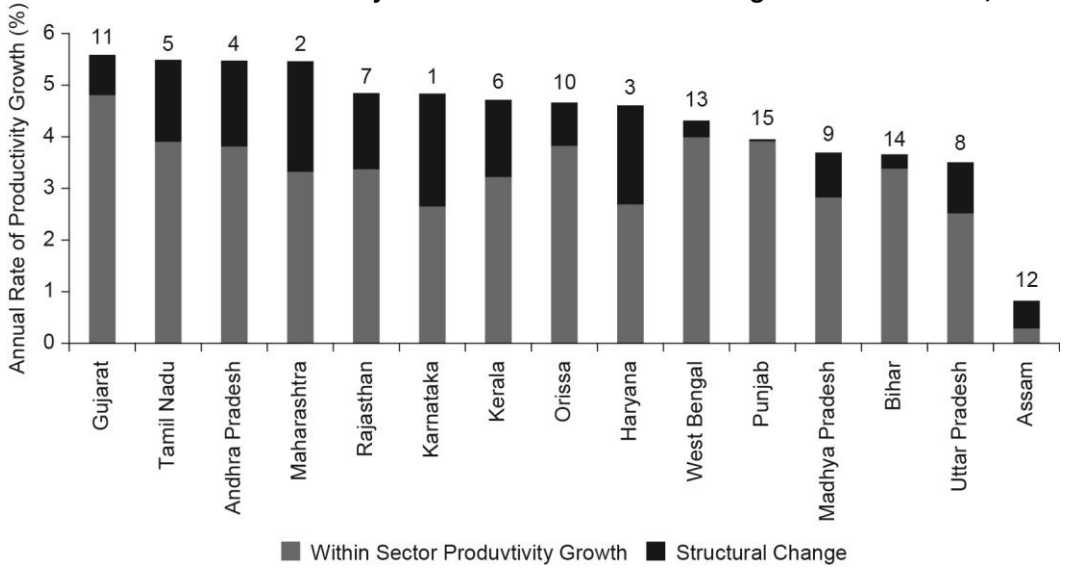
[25] This implication is highlighted by McMillan and Rodrik.

[26] McMillan and Rodrik, 2011.

[27] These are computed as follows: First, we calculate the annual growth rate of overall productivity. Next, we compute what proportion of the total productivity change in absolute terms is accounted for by structural transformation and within-sector productivity (i.e., and, respectively). These proportions are then multiplied to the annual growth rate of overall productivity to obtain the annualised growth rate of structural transformation and within-sector productivity growth, respectively. This closely follows the methodology used by McMillian and Rodrik as explained by Ahsan and Mitra (2012).

contributed positively to aggregate labor productivity growth in all states, although the extent of the contribution of the two components have varied significantly across the states. The contribution of structural change to aggregate labor productivity is highest in Karnataka, Maharashtra, and Haryana (as may be seen from the number above) and lowest in Punjab, Bihar, and West Bengal.

Figure 9: Within-Sector Productivity Growth and Structural Change in Indian States, 1987–2009



Notes: All values are in annualized percentage terms. States are sorted in order of the highest magnitude of total productivity growth. The numbers above the bars indicates how each state ranks with respect to the proportion of structural change in total productivity growth, i.e the length of the black bar.
Source: Author estimates based on Central Statistical Organisation reports.

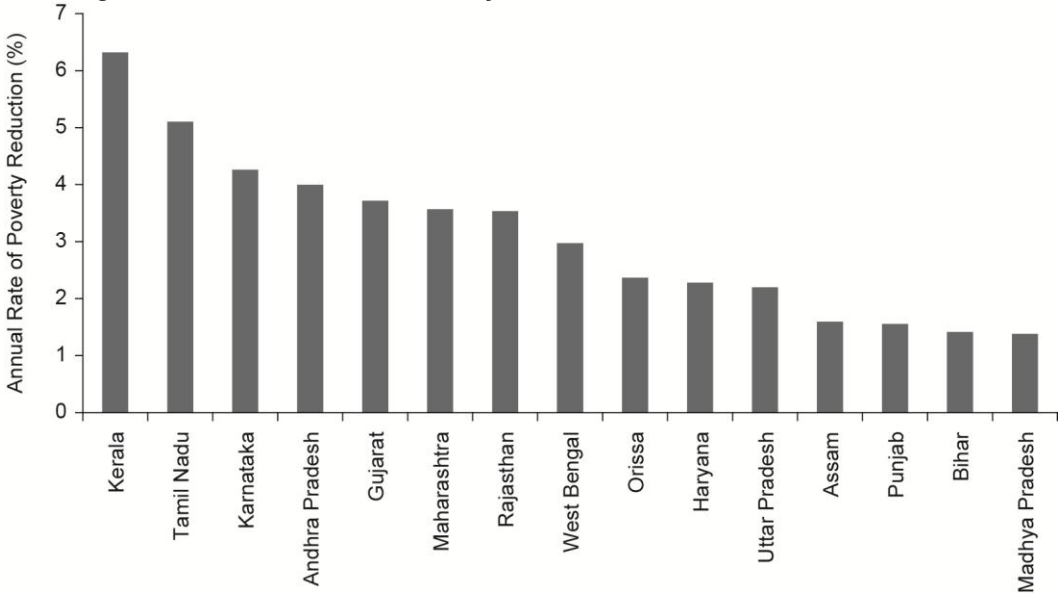
B. The Impact of Productivity Growth on Poverty Reduction

20. We next consider the experience of states with regard to poverty reduction. Figure 10 ranks states according to their annual rates of poverty reduction. The southern states of Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh have the highest rates of poverty reduction (4% per annum or higher), while the states with the lowest rates of poverty reduction are Madhya Pradesh, Bihar, Punjab and Assam (less than 2% per annum). Figures 11 and 12 show that both a higher pace of structural change (upper panel), as well as a higher pace of within-sector productivity growth (lower panel) are positively associated with a higher pace of poverty reduction. Of course, the relationships are not watertight. As may be seen, given the rates of structural change and within-sector productivity growth that Kerala has experienced, the extent of poverty reduction in the state has been far higher than what the simple linear relationship between poverty reduction and the two components of productivity growth would suggest.[28] To

[28] Whether Kerala's superior poverty reduction is on account of its superior human capital endowments à la Ravallion and Datt (1999) or mechanisms related to transfers (either public or private, such as through remittances from Kerala's diaspora spread across India and abroad) cannot be addressed by the data here.

a lesser extent, Madhya Pradesh also emerges as an outlier, though in a direction opposite to that of Kerala. In this state, the extent of poverty reduction has been considerably less than what the pace of structural change and within-sector productivity growth would suggest.

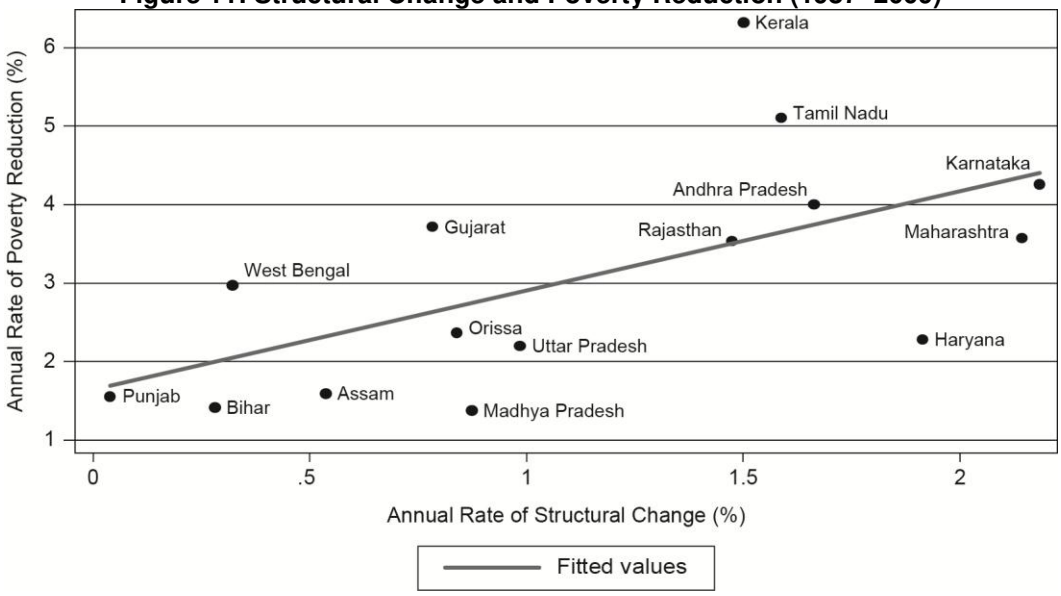
Figure 10: Annual Rate of Poverty Reduction in Indian States, 1987–2009



Notes: All values are in annualized percentage terms. States are sorted in order of highest magnitude of annual rate of poverty reduction.
Source: Authors' estimates based on National Sample Survey Organisation reports.

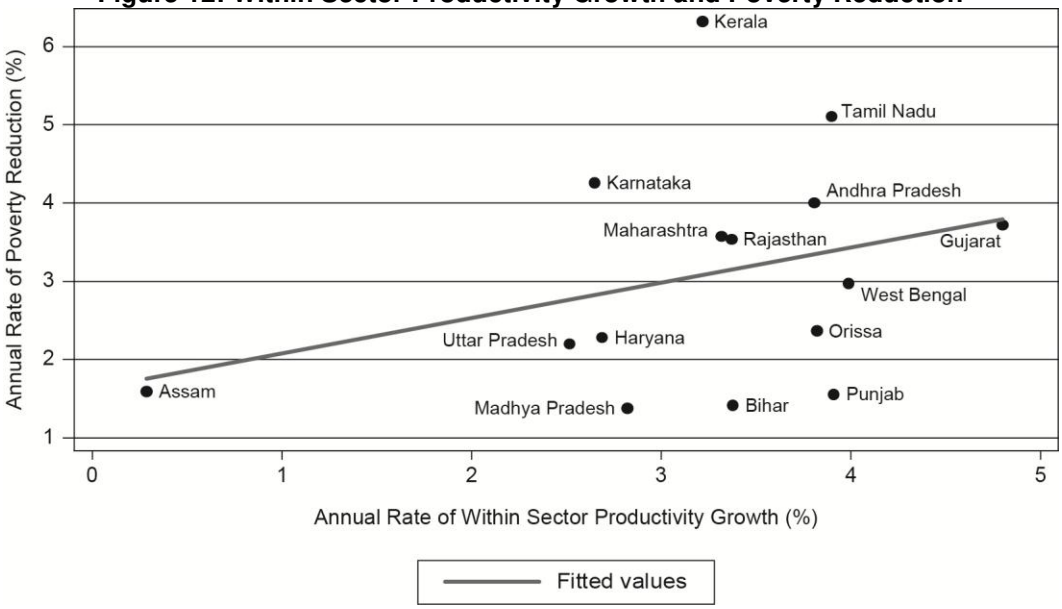
Figures 11 and 12: Productivity and Poverty Reduction in Indian States, 1987–2009

Figure 11: Structural Change and Poverty Reduction (1987–2009)



Source: Authors' estimates

Figure 12: Within Sector Productivity Growth and Poverty Reduction



Source: Authors' estimates

21. To probe a bit further into the relationship between productivity growth, its two components, and poverty we carry out some simple regression analysis involving the following regression specification:

$$\Delta Pov_{j,t,t-k} = \alpha + \beta \Delta X_{j,t,t-k} + \varepsilon \qquad (2)$$

where $\Delta Pov_{j,t,t-k}$ and $\Delta X_{j,t,t-k}$ are the annual rates of change in poverty headcount ratios and productivity growth for state j over $(t\text{-}k)^{th}$ and t^{th} years.

22. Table 2 describes the results of the regression analysis. These indicate that the higher is overall productivity growth, as well as its two components—productivity growth occurring due to the reallocation of labor (i.e., the "structural change" term) and "within-sector productivity growth"—the faster is the pace of poverty reduction. This holds for the full time period examined (i.e., 1987–2009; columns 1–3) as well as for only the post-liberalization years, 1993–2009 (columns 4–6). To understand the magnitude of the estimated relationship between productivity growth and poverty reduction, consider column (1). The estimated coefficient on the productivity growth term implies that a one percentage point increase in the annual rate of productivity growth leads to a 0.64 percentage point increase in the annual rate of poverty *reduction*. Taking the case of Andhra Pradesh, which experienced an increase of productivity growth from 4.6% per annum over 1993–2004 to 9% per annum over 2004–2009, the estimated coefficient suggests that Andhra Pradesh's poverty rate should have declined from 29.7% in 2004 to 22.01% by 2009. Had there been no increase in productivity growth, so that the latter remained at 4.6% per annum, the poverty rate by 2009 would be around 25.6%. As it happens, an increase in productivity of 4.4 percentage points per annum took place from 2004–2009 and Andhra Pradesh's headcount ratio ended up at 21.1% by 2009, a little lower than if productivity growth were the only factor determining the extent of poverty reduction.

Table 2: Effect of Total Productivity Growth and its Components on Poverty

	Dependent Variable: Annual Rate of Change in Poverty Rates					
	All Years (1987–2009)			**Post Liberalization Years (1993–2009)**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Constant	–0.0027	–0.0058	–0.0279***	0.0030	–0.0009	–0.0265***
	[–0.399]	[–0.803]	[–5.893]	[0.358]	[–0.098]	[–4.011]
Average Labor Productivity Growth	–0.6409***			–0.7183***		
	[–5.439]			[–5.381]		
Within Sector Productivity Growth		–0.6989***			–0.8109***	
		[–4.526]			[–4.455]	
Structural Change			–0.7784**			–0.9546**
			[–2.597]			[–2.541]
Observations	45	45	45	30	30	30
R-squared	0.4076	0.3227	0.1356	0.5084	0.4148	0.1874

Notes: The independent variables are in annualized rate of change terms. Specifications (1)–(3) estimate the coefficient for all the time periods under consideration, i.e. the periods 1987–1993, 1993-2004 and 2004-2009, while specifications (4)–(6) estimates coefficients for only post-liberalization years, i.e., the time periods 1993-2004 and 2004–2009. All values are in annualized percentage terms. t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' Estimates.

23. Interestingly, all productivity growth coefficients are larger in the post-liberalization period. Also, the coefficient for the "structural change" term is larger in absolute terms than the "within-sector productivity growth" term for both time periods, strongly suggesting that the

reallocation of labor from lower productivity to higher productivity sectors is an important means through which growth reduces poverty.

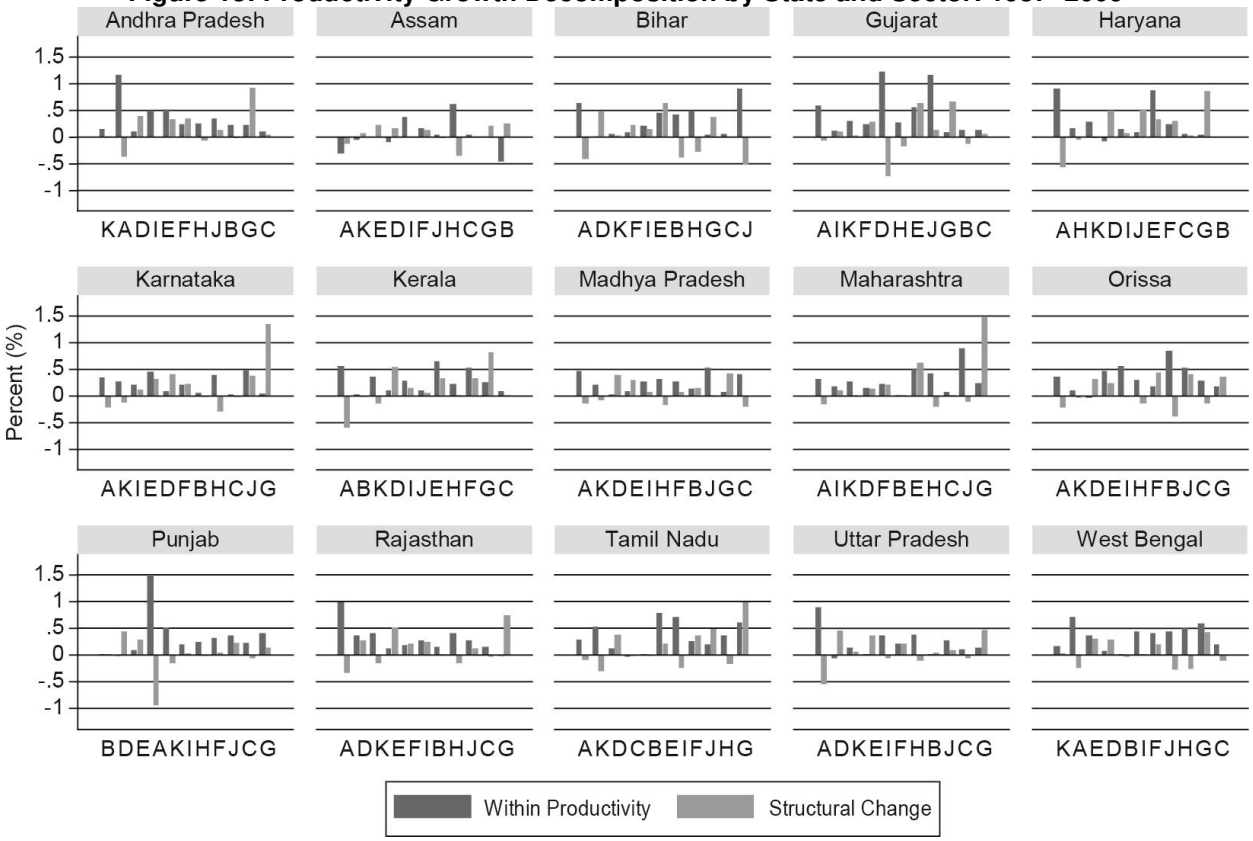
24. Indeed, a closer look at the drivers of aggregate productivity growth among states with strong and weak performance on poverty reduction is instructive. Of the states where the poverty rate declined by at least 4% per annum over 1987–2009 (Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh), all four performed well on the structural change component of aggregate productivity growth relative to most other states. Their relative performance on the within-sector component is more mixed. The starkest case is that of Karnataka, which had the second largest structural change component among the 15 states but experienced within-sector productivity growth that was one of the weakest (3rd lowest).[29] Among the weak performers on poverty reduction—i.e., states where the poverty rate declined by less than 2% per annum over 1987–2009 (Madhya Pradesh, Bihar, Punjab, and Assam)—the situation is somewhat converse. For example, while Punjab ranked favorably in terms of within-sector productivity growth (among the top 3 states), it experienced the second lowest amount of structural change. Similarly, while Bihar's within-sector productivity growth was middling (rank 7 out of 15), it had the third lowest structural change term.[30]

25. Figure 13 allows us to delve deeper into how individual sector experiences vis-à-vis the two components of productivity growth may be shaping the broader productivity growth–poverty reduction relationship. The figure displays by state, the extent of structural change and within-sector productivity growth in each of the 11 production sectors considered in this paper. As per equation (1), negative values for structural change in any given sector imply a reduction in its share in total state employment; negative values for within-sector productivity growth imply a reduction in sectoral labor productivity between 1987 and 2009. Production sectors appear across states in the figure based on (ascending) order of state- and sector-specific labor productivity in 2009.

[29] The relative rankings of the structural change and within-sector productivity growth components for each of the four states are, respectively: 5 out of 15 and 10 out of 15 for Kerala; 3 out of 15 and 4 out of 15 for Tamil Nadu; 2 out of 15 and 13 out of 15 for Karnataka; and 4 out of 15 and 6 out of 15 for Andhra Pradesh.

[30] The relative rankings of the structural change and within-sector productivity growth components for each of the four states are, respectively: 9 out of 15 and 11 out of 15 for Madhya Pradesh; 13 out of 15 and 7 out of 15 for Bihar; 14 out of 15 and 3 out of 15 for Punjab; and 15 out of 15 and 15 out of 15 for Assam.

Figure 13: Productivity Growth Decomposition by State and Sector: 1987–2009



A = Agriculture and Allied Activities; B = Mining and Quarrying; C = Public Utilities; D = Construction; E = Wholesale and Retail Trade, Restaurants and Hotels; F = Transport, Storage, and Communications; G = Finance, Insurance and Real Estate; H = Government Services; I = Community, Social and Personal Services; J = Registered Manufacturing, and K = Unregistered Manufacturing.
Source:

26. Focusing on the cases of Bihar, Karnataka, and Punjab, the following salient features may be noted. First, while labor reallocated out of agriculture in Bihar—the state's lowest productivity sector (as in 11 other states, the exceptions being in Andhra Pradesh, Punjab, and West Bengal)—it seems to have been primarily to relatively low productivity construction sector activities.[31] At the same time, several high productivity sectors saw declines in employment shares (which may be inferred from the negative values of the bars representing structural change). Interestingly, registered manufacturing was one of these latter sectors. Not only was it Bihar's highest productivity sector in 2009, it also showed the largest within-sector productivity increases over 1987–2009. In conjunction with the fact that unregistered manufacturing in Bihar displayed negligible increases in both of the two components of aggregate productivity (the third set of bars from the left), and that within-sector productivity in agriculture *increased*, a fairly plausible narrative for the weak response of poverty to aggregate productivity growth

[31] As in almost every other state (the exception of Punjab), labor productivity in Bihar's construction sector is higher than that in agriculture. However, the agriculture–construction sector differential in productivity is among the lowest in the case of Bihar. Coupled with the fact that the level of agricultural productivity in Bihar is among the lowest in the 15 states, we consider here (only Madhya Pradesh's was lower in 2009), the relatively low differential in productivity between the two sectors is probably an important reason for the shift of employment from agriculture to construction in Bihar to not be particularly poverty reducing.

in Bihar would include the state's inability to generate dynamism in modern, labor-intensive manufacturing.

27. Second, as in the case of Bihar, Karnataka experienced reallocation of employment out of agriculture. To the extent that some of this employment moved into the second lowest productivity sector (unregistered manufacturing), it did so to a sector that was experiencing some improvements in within-sector productivity (certainly much more so than the construction sector in Bihar). Moreover, the employment share of unregistered manufacturing itself declined so that overall employment shares should have moved unambiguously to significantly higher productivity sectors that would have pulled people out of poverty. Two other striking differences from the case of Bihar are the fact that the high productivity registered manufacturing sector not only experienced a relatively high degree of within-sector productivity growth but also an increase in its share of the state's employment, and that the highest productivity sector (encompassing finance, insurance, and real estate services) contributed significantly to the total structural change in the state. While one usually thinks of these sectors as mainly generating employment opportunities for high skilled (and therefore nonpoor) workers, recent work has begun to identify linkages between the growth of modern services sectors and employment opportunities for less skilled workers.[32]

28. Finally, in the case of Punjab—which experienced weak poverty reduction like Bihar (albeit starting with initially low poverty rates)—it is interesting to note that although the share of agriculture in state employment declined as elsewhere, agriculture has not been the lowest productivity sector. In fact, three other sectors had lower productivity than agriculture. Moreover, employment shares in two of these sectors increased (i.e., construction and wholesale as well as retail trade, hotels, and restaurants). Given these patterns, it is not surprising to note that an exit from agriculture has coexisted with weak structural change in the aggregate. Finally, the fact that agriculture in Punjab also experienced the highest amount of within-sector productivity change across all sectors and states (the result of healthy productivity growth and the large employment share of agriculture) serves to emphasize that poverty reduction requires not just an improvement in agricultural productivity. It also requires the emergence of modern, labor-intensive sectors that will make up for the exit of the workforce from agriculture.

C. The Determinants of Structural Change

29. We conclude with an attempt to shed exploratory light on the policy or policy-amenable factors that may influence the extent of structural change—the component of productivity growth that Table 2 shows is more strongly associated poverty reduction. We consider the initial employment shares in agriculture, initial education levels (in terms of average number of years of schooling), and indicators of labor market regulations, product market regulations, and financial development at the state level.[33] Initial employment shares in agriculture can be looked upon as capturing the potential for structural change in a state, since a larger initial share of workers engaged in low productivity agriculture implies a larger share of workers who can reallocate out of agriculture. Similarly, since education is widely believed to provide workers greater occupational mobility, states with a higher initial share of educated workers can be expected to experience greater structural change. Finally, states with better developed financial systems, more competitive product markets, and greater labor market flexibility are likely to be those with a more dynamic economic environment, allowing for a greater reallocation of resources from one economic activity to another. They may therefore be more likely

[32] Dehejia and Panagariya, 2012.
[33] Along the lines of McMillan and Rodrik.

to experience growth-enhancing structural change. As with the measures of poverty and productivity, details on these variables are provided in the Appendix.

30. Table 3 provides the results of our exploratory regression analysis. Each of the columns of the table includes as explanatory variables the initial share of workers in agriculture and workers years' of education. While the coefficient on average years of schooling fails to be statistically significant, that on the initial share of agriculture is significant across some of the specifications. It is positive in both instances, consistent with the idea that the variable captures the potential for structural change. Turning to the variables capturing elements of the investment climate, each is positive and statistically significant when introduced one at a time. The results suggest that states with better developed financial systems, more competitive product markets, and greater labor market flexibility experience faster structural change. When introduced simultaneously, however, it is only the financial development variable that retains its statistical significance. This should not be too surprising, however, since our labor market and product market regulation indicators pertain mainly to the manufacturing sector. On the other hand, the financial development variable used here captures the state of financial development for the state as a whole.

Table 3: The Determinants of Structural Change

	Dependent Variable: Annual Growth Rate of Structural Change				
	(1)	(2)	(3)	(4)	(5)
Constant	0.0234	–0.0535**	–0.0208	0.0171	–0.0555*
	[0.816]	[–2.538]	[–0.763]	[0.715]	–2.193]
Initial Employment	–0.0138	0.0506**	0.0283	0.0018	0.0541**
Share in Agriculture	[–0.418]	[2.341]	[0.944]	[0.065]	[2.264]
Initial Average Years	–0.0010	0.0018	0.0032	–0.0020	0.0027
of Schooling	[–0.349]	[1.092]	[1.168]	[–0.804]	[1.196]
Index of Financial		0.0051***			0.0043**
Development		[5.427]			[2.967]
Index of Labor			0.0106**		0.0034
Market Flexibility			[2.883]		[0.973]
Index of Product				0.0054**	0.0001
Market Competition				[2.542]	[0.041]
Observations	15	15	15	15	15
R-squared	0.0145	0.7320	0.4387	0.3793	0.7594

Note: t-statistics in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' Estimates.

IV. CONCLUDING REMARKS

31. Our review of recent empirical studies and our analysis of the links between growth, structural transformation, and poverty reduction lead us to note the following. First, viewed from the perspective of poverty reduction, growth in India has been inclusive. However, as comparisons with the experiences of East and Southeast Asian economies reveal, there appears to be considerable scope to increase the impact of growth on poverty reduction in India.

32. Second, while India's relatively weak performance in improving the health and educational status of its population may well be an important factor in explaining the muted link between growth and poverty reduction, as highlighted by previous literature, India's specific pattern of structural transformation is likely to have played an important role. In particular, significant reductions in the share of aggregate output contributed by agriculture—a sector that employed more than two thirds of India's labor force as recently as the 1980s and continues to employ around a half today—have taken place without significant increases in the productivity of agriculture and expansion of output in sectors with high potential to employ semiskilled workers productively, such as modern, labor-intensive manufacturing.

33. Indeed, the results of this paper indicate that the latter process, especially the reallocation of workers from lower to higher productivity sectors—and referred to as growth enhancing structural change by recent literature—is intimately connected to poverty reduction. States with the best performance in poverty reduction over 1987-2009 (such as Tamil Nadu,

Karnataka, and Andhra Pradesh) have tended to be precisely the ones registering a high degree of structural change. Conversely, states with the weakest track record in poverty reduction (such as Bihar, Madhya Pradesh, and Assam) have tended to be the ones registering a low degree of structural change.

34. Particularly instructive is the comparison between Bihar and Karnataka. Judged by the metric of within-sector productivity growth, Bihar's performance was the better of the two. However, of the reallocation of workers that took place across sectors, very little was from lower to significantly higher productivity sectors in Bihar. In fact, Bihar ranked 14th out of 15 states in terms of the extent of structural change, leading its overall productivity growth to be among the lowest of the 15 states. In contrast, structural change in Karnataka was the strongest in the country, leading the state to register a decent growth rate in aggregate productivity (6th out of 15 states) and 3rd best performance in poverty reduction (4.3% reduction annually in its poverty rate).

35. Third, our exploratory analysis of the drivers of structural change suggests that better functioning credit markets, competitive business regulations, and relatively flexible labor regulations are associated with a larger reallocation of labor from lower to higher productivity sectors. These findings are consistent with the view that a better investment climate is not only good for business, it is also an important means for making growth more pro-poor in a labor abundant country. By highlighting the importance of reallocation of resources to both growth and poverty reduction, the findings of this paper strongly suggest the need for more micro-oriented research, for example, using firm-level data, on the links between different types of economic policies and the decisions of economic agents on entry and exit across and within sectors of production and how these decisions influence employment opportunities.

APPENDIX

We describe here the data used in our analysis of state-level productivity growth, structural change, and poverty reduction over the time period 1987–1988 to 2009–2010. As noted earlier, we work with 15 major states of India defined in terms of their pre-2000 state boundaries.[34]

Poverty

Our measure of (absolute consumption) poverty is the poverty rate, i.e., the proportion of the population living below a given poverty line. We use the state-specific poverty lines developed by the Expert Group 2009 (Government of India, 2009) for the years 1993–1994, 2004–2005, and 2009–2010 (as updated by the Indian Planning Commission following the recommendations of the Expert Group). These poverty lines are then applied to the large-scale or quinquennial-round consumer expenditure surveys carried out by the National Sample Survey Organisation (NSSO) to obtain combined poverty rates for both rural and urban areas in the fifteen major states that we consider in our analysis.[35] Owing to the controversy surrounding the NSSO's consumer expenditure survey for 1999–2000 (on account of side-by-side placement of 7- and 30-day recall periods for consumption items in the survey questionnaire), we drop this year from our analysis entirely.[36]

However, given that the starting year for our analysis is 1987–1988 we are still left with the task of estimating the poverty rates for this year. To do so, we follow Cain, Hasan, and Mitra in extending the Expert Group's poverty lines back to 1987–1988. Cain, Hasan, and Mitra use Deaton's Fischer price indexes for 1993–1994 relative to 1987–1988[37] to translate the Expert Group's state and sector specific poverty lines for 1993–1994 to come up with their corresponding 1987–1988 values. They then use these poverty lines against the expenditure data reported in the 1987–1988 consumer expenditure survey to estimate poverty rates in that year. Cain, Hasan, and Mitra follow the procedures of the Expert Group so that, rather than use household expenditures reported on a uniform 30-day basis for their computations, they use 'mixed reference period' expenditures whereby the 30-day expenditures for high-frequency consumption items (food, fuels, etc.) are combined with 365-day expenditures for low-frequency consumption items (clothing, footwear and durables) duly prorated to 30 days.[38] Tables A1 and A2 describe the state-specific poverty lines and poverty rates used in this paper.

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[34] The states covered in this study includes Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. To maintain consistency in state boundaries over time, the newer states of Chhatisgarh, Jharkhand, and Uttarakhand have been merged with the states from which they were carved out, i.e., Madhya Pradesh, Bihar, and Uttar Pradesh, respectively.

[35] Combined rural and urban poverty estimates for any given state are simple averages of the corresponding rural and urban poverty estimates, each weighted by the sector's share in the combined population (as derived from the consumer expenditure survey data).

[36] See Cain, Hasan, and Mitra (2010) for a detailed summary of the debates surrounding poverty lines in India. Also see Deaton (2003).

[37] Deaton 2003.

[38] The Expert Group's procedures for estimating poverty in 1993–1994, 2004–2005 and 2009–2010 rely on monthly per capita expenditures based on a 'mixed reference period' of 365 days for 'low frequency' items of consumption (pro-rated to 30 days and covering clothing, footwear, durables, and expenditures on education and health (institutional)) and 30 days for the remaining items, including food. The consumer expenditure survey for 1987–1988 collected expenditures on a 365-day basis for three of the low frequency groups, i.e., clothing, footwear and durables; education and health

expenditures were only collected on a 30-day basis. However, this is unlikely to raise serious comparability issues vis-à-vis the other two rounds since the weight of these items in total consumption expenditures is not very high.

Table A1: Poverty Lines

	Round 43		Round 50		Round 61		Round 66	
	1987–1988		1993–1994		2004–2005		2009–2010	
State	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
Andhra Pradesh	138.9	159.2	244.1	282.0	433.4	563.2	693.8	926.4
Assam	153.4	172.7	266.3	306.8	478.0	600.0	691.7	871.0
Bihar	147.8	161.7	236.1	266.9	433.4	526.2	655.6	775.3
Chhattisgarh			229.1	283.5	398.9	513.7	617.3	806.7
Gujarat	163.8	193.9	279.4	320.7	501.6	659.2	725.9	951.4
Jharkhand			227.7	304.1	404.79	531.3	616.3	831.2
Haryana	168.7	175.7	294.1	312.1	529.4	626.4	791.6	975.4
Karnataka	152.4	166.6	266.9	294.8	417.8	588.1	629.4	908.0
Kerala	166.5	166.9	286.5	289.2	537.3	584.7	775.3	830.7
Madhya Pradesh	135.3	160.7	232.5	274.5	408.4	532.3	631.9	771.7
Maharashtra	155.5	181.9	268.6	329.0	484.9	632.9	743.7	961.1
Orissa	136.1	166.4	224.2	279.3	407.8	497.3	567.1	736.0
Punjab	150.5	183.0	286.9	342.3	543.5	642.5	830.0	960.8
Rajasthan	163.0	174.9	271.9	300.5	478.0	568.2	755.0	846.0
Tamil Nadu	150.7	169.2	252.6	288.2	441.7	559.8	639.0	800.8
Uttar Pradesh	145.5	170.1	244.3	281.3	435.1	532.1	663.7	799.9
Uttaranchal			249.5	306.7	486.2	602.4	719.5	898.6
West Bengal	141.4	173.0	235.5	295.2	445.4	572.5	643.2	830.6

Notes: Poverty lines are drawn from Amoranto and Hasan (2010) and Cain, Hasan, and Mitra (2010) for the 43rd round and Government of India (2009 and 2012) for the 50th, 61st, and 66th rounds. State and sector specific poverty lines are used in conjunction with NSS consumer expenditure survey data to obtain poverty rates for each state as a whole (i.e., rural + urban).

Table A2: Poverty Rates

	1987–1988	1993–1994	2004–2005	2009–2010
Andhra Pradesh	51.8	44.6	29.7	21.1
Assam	54.0	51.8	34.5	37.9
Bihar	68.8	60.5	52.2	50.3
Gujarat	52.9	37.8	31.7	23.0
Haryana	33.4	36.0	24.1	20.1
Karnataka	61.5	49.5	33.4	23.6
Kerala	50.4	31.3	19.6	12.0
Madhya Pradesh	55.3	46.4	48.9	40.7
Maharashtra	54.5	47.9	38.3	24.5
Orissa	62.6	59.1	57.2	37.0
Punjab	22.5	22.4	20.9	15.9
Rajasthan	54.7	38.3	34.4	24.8
Tamil Nadu	54.2	44.8	29.4	17.1
Uttar Pradesh	59.9	47.7	40.5	36.7
West Bengal	51.9	39.4	34.2	26.7

Notes: Bihar, Madhya Pradesh, and Uttar Pradesh are defined in terms of their pre-2000 boundaries (and thus include Jharkhand, Chhattisgarh, and Uttaranchal, respectively). Source: Cain, Hasan, and Mitra (2010) for 1987 and Government of India (2009 and 2012) for the years 1993, 2004, and 2009.

Output

Our data on state domestic product and its sectoral composition is from the Central Statistical Organisation (CSO), Government of India. We organize the real sectoral output data into eleven broad sectors, namely: (i) agriculture and allied activities, (ii) mining and quarrying, (iii) registered manufacturing, (iv) unregistered manufacturing, (v) construction, (vi) public utilities that include electricity, water supply and gas, (vii) transport, storage and communications, (viii) wholesale and retail trade; hotels and restaurants, (ix) finance, insurance and real estate, (x) government services, and (xi) community, personal and social services. The data on output from 1983–1984 to 2009–2010 is available for four different base years: 1980–1981, 1993–1994, 1999–2000 and 2004–2005 with several overlapping years across different bases. To arrive at a uniform base, 2004–2005 in our study, we create linking factors at the sector level. These linking factors are based on the average ratios of sector output available over the common years.

Employment

We use the employment–unemployment surveys of the NSSO for the years 1987–1988, 1993–1994, 2004–2005, and 2009–2010 to get estimates of employment across industries and states. We follow the principal usual activity status to determine employment status and the national industrial classification code corresponding to the usual status to determine the broad sector of employment for the worker. Principal usual status defines the employed as those who (i) work in household enterprises, i.e., self-employed or own account workers; (ii) work as helpers i n household enterprises (unpaid family workers); (iii) work for regular salaries or wages; and (iv) work as casual wage earners. We consider workers of all ages.

We supplement the information from the employment–unemployment surveys with data on employment in registered manufacturing from the Annual Survey of Industries (ASI).[39] This addition is crucial for constructing real value added and employment data separately for the registered manufacturing and unregistered manufacturing. Since the NSSO employment–unemployment survey data gives us employment figures for the manufacturing sector as a whole, we compute employment numbers for unregistered manufacturing by subtracting registered manufacturing employment (ASI) from total manufacturing employment (NSSO). In doing this exercise, we are careful to match and harmonize the data across years and data sources, using the National Industry Classification (NIC) codes so that a consistency in definitions of the broad sectors is maintained throughout. Table A3 describes the NIC codes used in various NSSO survey rounds. Table A4 explains how we have harmonized NIC codes for the ten broad industry groups (at the two-digit level of classification).

[39] ASI time series data (1998-99 to 2007-08) is available at: http://mospi.nic.in/Mospi_New/upload/asi/ASI _main.htm?status=1&menu_id=88. ASI unit level data is used for computing employment figures in registered manufacturing for 1987 and 1993.

Table A3: National Industry Classifications across National Sample Survey Rounds

Round	Year	NIC Classification
38	1983	1970
43	1987–1988	1970
50	1993–1994	1987
55	1999–2000	1998
61	2004–2005	1998
66	2009–2010	2004

NIC = National Industry Classifications.

Source: Various National Sample Survey Organization Reports

Table A4: Harmonizing National Industry Classification Codes over Time at the Two-Digit Level

Name of Broad Industry Group	Industry	Round 43 NIC 1970	Round 50 NIC 1987	Round 61 NIC 1998	Round 66 NIC 2004	Harmonized Industry Code
Agriculture and Allied Industries (Hunting, Forestry and Fishing)	AG	0	0	01,02 & 05	01,02 & 05	1
Mining and Quarrying	MIN	1	1	10 to 14	10 to 14	2
Manufacturing	MFG	2 & 3	2 & 3	15 to 37	15 to 37	3
Electricity, Gas and Water	PU	4	4	40&41	40&41	4
Construction	CONST	5	5	45	45	5
Wholesale and Retail Trade: Restaurants and Hotels	WRT	6	6	50 to 52 & 55	50 to 52 & 55	6
Transport, Storage and Communications	TSC	7	7	60 to 64	60 to 64	7
Finance, Insurance, Real Estate	FIRE	8	8	65 to 67 & 70 to 74	65 to 67 & 70 to 74	8
Public Administration; Government Services	GOV	90	90	75	75	9
Community, Social and Personal Services	CSP	91 to 99	91 to 99	80,85,90 to 93 & 95	80,85,90 to 93 & 95	10

Source: Various National Sample Survey Organization Reports

Other Variables

We capture initial conditions in states through the 1987 share of employment in agriculture and average number of years of schooling among the employed. For constructing the initial average number of years of schooling, we closely follow Cain, Hasan, Magsombol, and Tandon (2010). Table A5 generates a variable denoting the number of years of schooling corresponding to each general education code in the 43rd NSSO survey round. Information on other rounds is provided for reference. We restrict our attention to those defined as employed on a principal activity status basis and construct our average years of education over this group.

Table A5: Concordance of Education Categories across National Sample Survey Rounds and Number of Years of Education

Round 43		Round 50		Round 61		Round 66		Harmonized Codes	Number of Years of Education
Code	Description	Code	Description	Code	Description	Code	Description		
0	not literate	1	not literate	1	not literate	1	not literate	1= Below Primary	0
1	literate w/o formal schooling	2	literate through attending NFEC/AEC	2	literate through attending EGS/NFEC/AEC	2	literate through attending EGS/NFEC/ AEC		1
		3	TLC	3	TLC	3	TLC		1
		4	Others	4	Others	4	Others		1
2	literate but below primary	5	literate but below	5	literate but below primary	5	literate but below primary		2.5
			primary						
3	primary	6	primary	6	primary	6	primary	2 = Primary	5
4	middle	7	middle	7	middle	7	middle		8
5	secondary	8	secondary	8	secondary	8	secondary	3 = Secondary	12
		9	higher secondary	10	Higher secondary	10	Higher secondary		12
				11	Diploma/certifica te course	11	Diploma/certi ficate course		12
7	Graduate and above in engineering /technology	11	Graduate and above in engineering /technology	12 or 13	Graduate/ Postgraduate and above	12 or 13	Graduate/ Postgraduate and above	4 = Tertiary and Above	15
8	Graduate and above in medicine	12	Graduate and above in medicine						15
9	Graduate and above in other subjects	13	Graduate and above in other subjects						15

Note: AEC = Adult Education Centres; EGS = Education Guarantee Scheme; NFEC = Non-formal Education Courses; TLC = Total Literacy Campaign.

Source: Cain, Hasan, Magsombol, and Tandon (2010) and authors' estimates

To capture the state-level policy environment, we consider measures of labor market flexibility, product market competition (PMR), and financial development (FINDEV). These measures are taken from Hasan, Mitra, and Ramaswamy (2007); Gupta, Hasan, and Kumar (2009); and Cain,

Hasan, and Mitra, respectively.[40] Table A6 reports the values taken for these and the initial conditions variables.

Table A6: State Characteristics

State	Initial Employment Shares in Agriculture (1987)	Initial average years of schooling (1987)	Labor Market Regulations (FLEX)	Product Market Regulations (PMR)	Initial Level of Financial Development (1987) (FINDEV)
Andhra Pradesh	0.67	2.02	1	0	6.39
Assam	0.70	3.83	0	–1	2.69
Bihar	0.74	2.47	0	–1	3.37
Gujarat	0.56	3.48	1	0	5.67
Haryana	0.57	4.02	0	1	6.09
Karnataka	0.66	3.03	1	1	7.04
Kerala	0.47	5.72	0	0	6.66
Madhya Pradesh	0.77	2.13	0	–1	5.09
Maharashtra	0.63	3.70	1	1	6.42
Orissa	0.68	2.27	0	–1	4.49
Punjab	0.52	4.51	0	1	4.65
Rajasthan	0.64	1.94	1	–1	4.97
Tamil Nadu	0.51	3.52	1	1	7.78
Uttar Pradesh	0.70	2.86	0	0	4.10
West Bengal	0.52	3.73	0	–1	4.91

Notes: 1. Labor market flexibility measure (FLEX) is based on Hasan, Mitra and Ramaswamy (2007); 1 refers to flexible and 0 refers to inflexible labor regulations. 2. Product Market Regulations (PMR) measure is based on Gupta, Hasan and Kumar (2009); 1 refers to competitive, 0 refers to neutral and –1 refers to cumbersome product market regulations. 3. Financial Development (FINDEV) is interpolated for 1987 and is based on the Financial Infrastructure Development Index (for years between 1971–1972 and 1997–1998) quoted in Ghosh and De (2004). Larger values of FINDEV represent states with a relatively well-developed financial system.

[40] These papers use information and indexes created by a number of other researchers and studies including Besley and Burgess (2004) on labor regulations; OECD (2007) and World Bank (2004) on product market regulations and the investment climate, respectively; and Ghosh and De (2004) on financial development across India's states. Ghosh and De construct an index of states' financial development using information from 1981 to 1997 on credit-to-deposit ratios in nationalized banks, share of state tax revenue in net state domestic product, and the number of post offices per 10,000 of the population.

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