CHAPTER 2

Economic Growth, Agriculture and Food Systems: Explaining Regional Diversity

2.1 Introduction

The Green Revolution of the 1960s transformed India from a net importer of food to a self-sufficient agricultural giant. This *agriculture-led growth* of the 1970s, along with liberalization policies of the 1990s, has been credited with catalyzing the country's remarkable growth in the last two decades. In 2017, India became the sixth largest economy in the world, beating France and closely tied with the UK. Agricultural growth in the country has come to be associated with green paddy fields and overflowing storehouses of surplus grains. Economic development has created globally competitive companies and metropolises. The global face of the Indian labor force is both cosmopolitan and high skilled. Increasing incomes per capita of individuals, as represented by the growing size of the Indian middle class, has brought with it both reduction in overall poverty and a decrease in hunger and undernutrition across the country. On the global platform, India has emerged as a thought leader in discussions related to climate change, poverty and development and international trade. This economic progress of the country has come about due to its structural transformation[1] (ST) from a subsistence agriculture-based economy to

[1] Structural transformation is a process of economic development during which an economy reallocates economic activities across its agriculture, industry and service sectors (Herrendorf, Rogerson, & Valentinyi, 2013). ST is characterized by the declining share of the agricultural sector and a declining share of agricultural employment (P. Pingali, 2007a)

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one that has a modernizing agricultural system over the last five decades. In line with the predictions of ST theory, India has also seen a decline in agricultural share in GDP, an increase in labor productivity, growth in urbanization and a reduction in poverty during this time.

Discussing India's growth success as if it is a pan-India phenomenon overshadows the disparate experiences in its subnational growth process (U. Kumar & Subramanian, 2012; Kurian, 2000; Panagariya, Chakraborty, & Rao, 2014; P. Pingali & Aiyar, 2018). After growing by 1–2% between the 1960s and 1980s, India began to grow by 3–4% year on year in the post-liberalization era and around 6–7% over the last one and a half decades. A back of the envelop calculation suggests that there have been at least half of the Indian states that doubled incomes in the first 35 years after independence and then in approximately half the time doubled their incomes again. In other states, state GDP increased by less than double over the entire period (1960–2017). Even though doubling incomes within 60 years is impressive in and of itself, these divergent development experiences across states have created disparities in their development outcomes. The outcome of this regional disparity is reflected in Fig. 2.1. While India leads the South Asia experience for growth, some states such as Bihar and Uttar Pradesh have worse economic outcomes compared to some countries in sub-Saharan Africa. Other states such as Delhi and Goa are comparable to countries in Latin America. These stark differences in the regional growth experience are also reflected in other indicators such as nutrition or poverty. For example, undernutrition in Madhya Pradesh continues to remain a key nutrition challenge, but in Kerala, rising obesity has brought the problem of over-nutrition into focus. Similarly, while rural poverty in Punjab has reduced due to agricultural development, in Orissa,

even as the value added of agriculture and agricultural productivity increases. This phenomenon is driven by either (1) faster growth of value added in other sectors, industry or services, which drives changes in employment patterns (Chenery, 1960), or (2) through agriculture-led productivity growth which itself can stimulate demand for non-agricultural products and non-agricultural employment (B. B. F. Johnston & Mellor, 1961). Both of these growth strategies increase rental incomes from factors of production whose productivity has increased through this process. This creates a virtuous cycle of economic growth. Over time, ST processes have come to be associated with greater economic growth, increase in productivity of factors of production, a reduction in the share of the agricultural sector in GDP, increase in the rates of urban-led growth, increase in incomes, poverty reduction, better nutritional security and greater diet diversity (Chenery, 1960; Pingali, Ricketts, & Sahn, 2015; P. C. Timmer, 1988; P. C. Timmer & Akkus, 2008; P. Webb & Block, 2013).

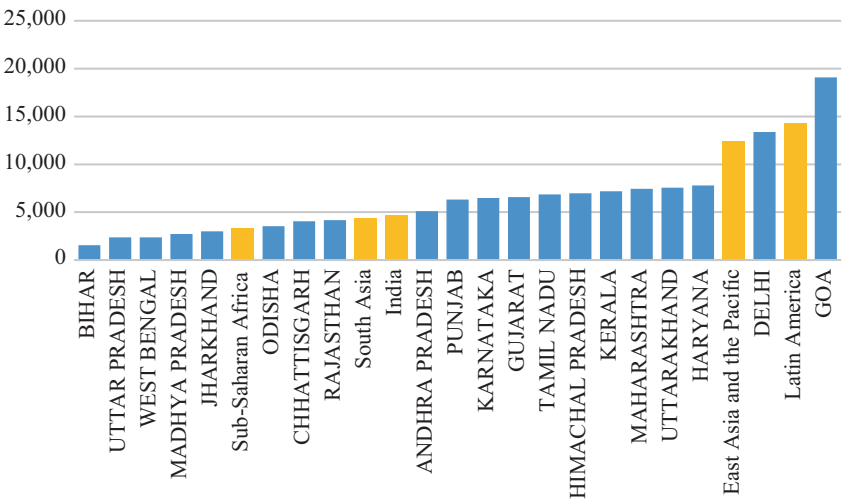

Fig. 2.1 International comparisons in GDP per capita (PPP in constant 2011 international $). Source: National Accounts Statistics & World Bank DataBank (2015–16); based on authors calculations

it remains high and spatially determined. Similarly, measures such as night light intensity—which capture economic activity and levels of urbanization—suggest higher development in the south and northwest areas of the country compared to others (Fig. 2.2).

In this chapter, we propose two major arguments to explain the regional divergence in growth. The first argument builds on the idea that states in India have structurally transformed differentially based on their comparative advantages. In Fig. 2.3, we see that each state in India has started its process of ST at different levels in the 1960s as well as transformed over time at a different pace. Absolute advantages in returns to land, labor and capital played a major role in determining the level at which states started in the development process. However, comparative advantages led to states benefiting differentially from national growth policies. Between the 1950s and 2000s, national growth policies supported either heavy industry development, the development of the agricultural sector, the development of small-scale industries or the service sector (Fig. 2.4). As a consequence, investments made by states in developing "within state" comparative advantages created new avenues for growth. Along with serendipitous changes in aggregate demand, driven by either changes in the local or global economy, these state

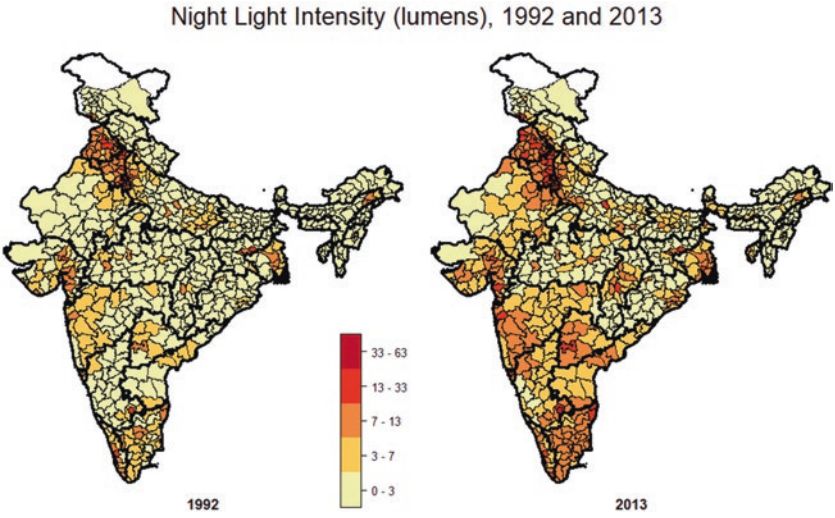

Fig. 2.2 Growth of urban areas. Source: AidGeo Data; based on authors calculations

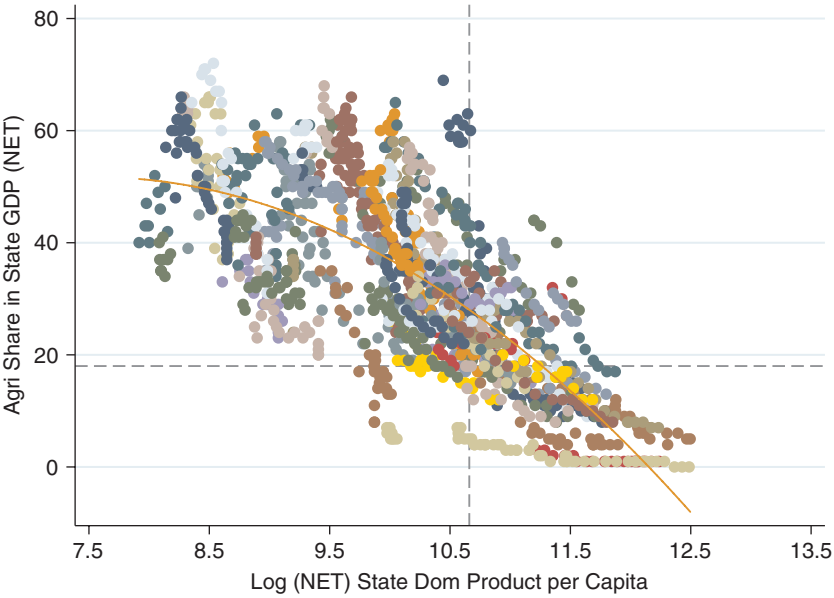

Fig. 2.3 Subnational structural transformation in India (1960–2017). Source: National Accounts Statistics; based on authors calculations

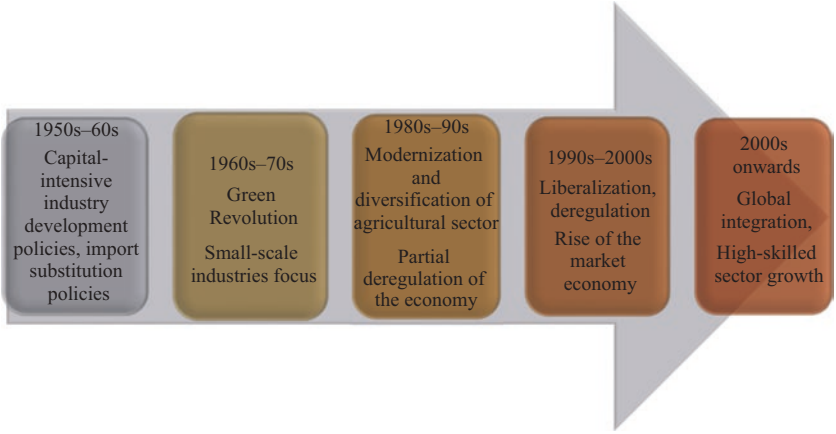

Fig. 2.4 Indian policy priorities over time

policies in concert with the national policies led to a divergence in the regional growth experience (Bhalla & Singh, 1997; Kurian, 2000; Ghosh, 2006; Bhattacharya & Sakthivel, 2004).

The second argument is embedded in the concept of labor market frictions. In this chapter, we argue that high search and entry costs into urban and non-agricultural labor markets have prevented a smooth outmigration of underemployed labor from the agricultural sector to the non-agricultural sector. During the ST process, economic growth is theorized to be accompanied by a reduction in the share of people employed in agriculture. As unemployed individuals migrate towards new opportunities in the non-agricultural sector, labor productivity in agriculture and hence returns to agriculture are expected to increase. However, in India, the decline in the share of agriculture in GDP has not been associated with a commensurate decline in agricultural employment share in total employment. Compared to countries with similar experiences in ST such as the Philippines and Nigeria, agricultural employment share continues to remain high (Fig. 2.5). This fact is further reiterated in Table 2.1. Here we see that agricultural share in total employment has nearly halved from 1991 to 2011, decreasing from 57% to 28%. However, states have been transitioning at different paces. Less than 20% of the population remains engaged in agriculture in Goa and Kerala, but in states like Mizoram and Andhra Pradesh, slightly more than 40% of employment still comes from the agricultural sector. In spite of urban wages growing faster than rural

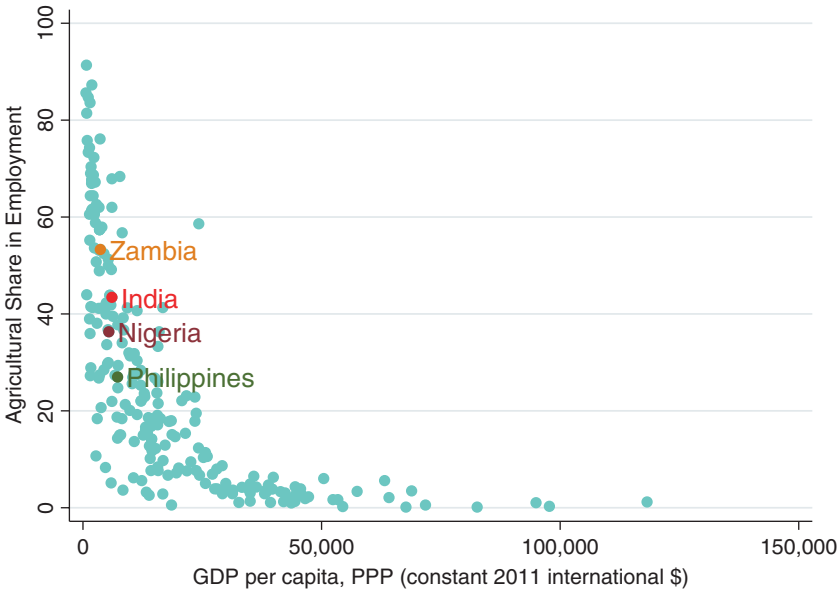

Fig. 2.5 Global comparison of agricultural employment share. Source: National Accounts Statistics & World Bank DataBank (2015–16); based on authors calculations

wages (Bhagat, 2017; Kone, Liu, Mattoo, Ozden, & Sharma, 2016; Munshi, 2011; P. Pingali, 2007b, 2015), census records indicate that rural to rural migration patterns dominate migration streams and many individuals continue to work as agricultural laborers (Fig. 2.6). This implies that labor markets have not been able to employ surplus underemployed labor from the agricultural sector and agricultural labor productivity continues to remain low with vast differences by region.

In order to illuminate the above mechanisms that have impacted regional diversity in growth, in this chapter, we forward evidence from the literature from India. We show that regional comparative advantages (or the lack of it) in resource availability may have benefited some regions over others. In combination with the growth of local and global demand for goods and services, these comparative advantages in inputs have exacerbated subnational divergence in the growth experience. Second, we discuss various labor market frictions that have inhibited a smooth transition of labor from agricultural to the non-agricultural sectors. We show that rural to rural migration in the agricultural sector can be explained by the difference in

Table 2.1 Employment transition during structural transformation

Year	*The share of agricultural employment in total employment*					
	<20%	*20–30%*	*30–40%*	*40–50%*	*>50%*	*Country average (%)*
1991		Goa	Kerala	Gujarat, Haryana, West Bengal	Himachal Pradesh, Punjab, Assam, Maharashtra, Mizoram, Rajasthan, Tamil Nadu, Karnataka, Manipur, Orissa, Sikkim, Arunachal, Meghalaya, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Nagaland, Bihar	57
2001	Goa, Kerala	Assam, Gujarat, Haryana, Himachal Pradesh, J&K, Jharkhand, Manipur, Orissa, Punjab, Tripura, West Bengal	Karnataka, Madhya Pradesh, Maharashtra, Mizoram, Rajasthan, Tamil Nadu, Uttarakhand, UP	Andhra Pradesh, Arunachal Pradesh, Bihar, Chhattisgarh, Meghalaya, Nagaland		32
2011	Goa, Kerala	Assam, Haryana, Himachal Pradesh, J&K, Jharkhand, Orissa, Punjab, Sikkim, Uttarakhand, UP, TN, Tripura, West Bengal	Arunachal Pradesh, Bihar, Chhattisgarh, Gujarat, Karnataka, Manipur, Meghalaya, Nagaland, Madhya Pradesh, Maharashtra, Rajasthan	Andhra Pradesh, Mizoram		28

Source: Author's calculations based on census data

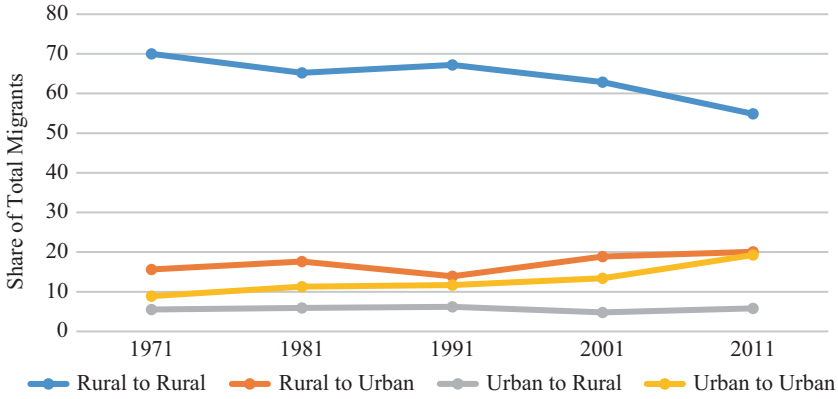

Fig. 2.6 Migration patterns over time. Source: V. K. Singh, Kumar, Singh, and Yadava (2011) and census 2011 migration tables; based on authors calculations

agricultural productivity across states. Low rural to urban migration, more characteristic of the agricultural to non-agricultural migration, has been slower due to poor access to appropriate skills, in addition to geographical challenges that migration poses.

2.2 Explaining Inter-State Divergence in Structural Transformation

It is a widely recognized fact that the main driver for the ST process in India was the Green Revolution that began soon after India's independence.[2] To address concerns of food insecurity, rural poverty and low agricultural surplus, policy makers pushed for a nationally oriented agricultural productivity growth policy.[3] Modern high-yielding varieties (HYV) of seeds and

[2] While some may argue that Nehruvian policies on industrial substitution enabled capital accumulation in the country, it is a well-recognized fact that it was the Green Revolution that spread technology into the rural heartland of India. This change played a greater role in poverty reduction, thus stimulating the Indian economy.

[3] It is important to mention that India had already set in place national-level policies for import substitution industrialization policies in the 1950s. However in the 1960s, a burgeoning food deficit, high rural poverty and low rates of urbanization and lack of savings and capital resource accumulation turned policy focus towards development through agriculture. After the Green Revolution created agricultural surplus and put the economy on the process for ST, there was a renewed focus on industrial development. This allowed states where agriculture productivity was still low to invest more in other sectors.

fertilizer technology were first introduced in the late 1960s and early 1970s, in states with high agro-climatic potential and irrigation infrastructure that were considered highly suitable for agricultural intensification and yield enhancing technical change (G. S. Bhalla & Singh, 1997; C. H. H. Rao, 1975, 1994; G. S. Bhalla & Tyagi, 1989). Due to their comparative advantages in farming, northwestern states such as Punjab and Haryana and the southern delta regions in Andhra Pradesh and Tamil Nadu quickly adopted HYV of wheat and rice and, within a short period, became the leaders of the Green Revolution, both regarding food production and productivity. States in the east, such as Bihar and Orissa, that were rich in agricultural lands lost out due to the poor technology suitability, poor infrastructure and lack of institutional support (Bajpai & Sachs, 1996; Prahladachar, 1983).

Between the 1980s to the 2000s, greater development and growth from the agricultural sector was driven by diversification of cropping systems away from staple food grains to cash crop production and by greater use of fertilizers as inputs in production (G. S. Bhalla & Singh, 1997). Some states such as Kerala which did not have a comparative advantage in staple grain production capitalized on the growing demand for fruit, spices and rubber from local and global markets, and invested in tropical plantations (M. G. Rao, Shand, & Kalirajan, 1999). Semi-arid zones of Central India adopted the new crops and varieties of cotton and oil and reoriented their agricultural systems towards the production of these cash crops. Agriculture in these states was able to benefit from the growth in demand for cotton and oil seed that occurred post the staple grain revolution. As a result, these states witnessed a transformation in their agricultural sectors, while states such as Bihar, UP, MP[4] and Odisha that continued to remain focused on staple grain production lost out.

Side by side with the agricultural transformation,[5] the industrial (non-agricultural) policies that were instituted in the 1950s began to

[4] In Pingali, Mittra, and Rahman (2017), authors discuss the MP transformation. Over the last two decades, MP has made tremendous progress towards reforming the agricultural system by utilizing low labor costs and high cropping area availability. MP is now a major supplier to the PDS system and has overtaken Punjab and other states in staple grain production. However, agricultural productivity, though increasing, continues to remain low.

[5] In this chapter we interchangeably use the concept of the Green Revolution and the agriculture revolution. Here with the former we mean the introduction of new high-yielding varieties of wheat and rice, along with innovations in irrigation, water use and fertilizer and pesticide use that revolutionized agriculture in India. The agriculture revolution refers to the Green Revolution along with the diversification of cropping systems across the country that came up in response to changing local and global demand for high-value products such as tea, coffee, rubber and so on.

bear fruit in the 1980s (Aghion, Burgess, Redding, & Zilibotti, 2008; Bhattacharya & Sakthivel, 2004; S. E. Ghani, Grover, Kerr, & others, 2016; M. Ghosh, 2006; U. Kumar & Subramanian, 2012; Rodrik & Subramanian, 2004). The direct impact of the Green Revolution had been twofold. One, it decreased rural poverty, thus stimulating aggregate demand from rural areas (Pingali, 2012). Two, as more agricultural capital and labor surplus was released through rapid increases in productivity into the industrial sector, returns to industrial investments began to pay off. For example, during the initial stages of the Green Revolution, growing needs for construction and power in agriculture drove demand for manufacturing products. Thus some states which had not benefited from the Green Revolution refocused their development strategies, on their comparative advantage, in developing their non-agricultural sectors. In Panagariya et al. (2014), authors discuss that state policies, with regard to urban land ceiling ownership, labor policies, capital markets, small industry policies and bankruptcy laws, varied across states. This created distortions to the returns in capital and labor endowments both across industries and across states. Thus different types of industries (capital or labor intensive) developed in some states vis-a-vis others. Given that India was a closed economy during this time, locally determined demand for goods and services eventually drove profitability across industries. This contributed to cross-sector differences in growth and thus subnational differential growth rates as well.

However, by the 1990s, the liberalization of the Indian economy created another force of divergence in the structural transformation experience. Integrating the economy into the global playing field led to different trends in non-agricultural growth that varied by sectors and states (Chakravorty, 2003; S. E. Ghani et al., 2016). In the literature, there were many reasons attributed to how comparative advantages were created and altered across states during this time. Existence of poor performing state monoliths that could not compete in the international markets, divergence in input factor productivity due to different speeds of tariff deregulation and a political economy that had supported incumbent firms over others pre-liberalization were hypothesized to have affected comparative advantages across states (Kurian, 2000; Rodrik & Subramanian, 2004; Aghion et al., 2008; Kumar & Subramanian, 2012). States that produced goods with high global demand, using the factor of production in which they had a comparative advantage, thus saw an increase in their GDPs relative

to states that did not. For example, the fertilizer industry grew faster in response to liberalization, but the iron and steel industry slowed down since local industries were not competitive with global suppliers (Aghion et al., 2008; U. Kumar & Subramanian, 2012). This led to states like Gujarat, whose industries were focused on fertilizer production, growing faster than states like Bihar, which relied on iron and steel production. Among those who had stimulated their economic growth through agricultural development, states that focused only on the production of crops for domestic demand were not able to keep pace with those who diversified their agriculture into export-oriented crops.

The liberalization of the economy and its integration into the world of internet technology created another wedge in the inter-state development processes. In some states, globalization of the economy in combination with comparative advantages created through human capital investments in the past and reforms in the telecom sector facilitated a service sector transformation (Amirapu & Subramanian, 2015; Arnold, Javorcik, Lipscomb, & Mattoo, 2012; Nagaraj, 2009). States like Maharashtra, Karnataka and Tamil Nadu, which had invested heavily in high-skilled human capital development as well as in technology infrastructure, greatly benefited from the technology boom that was driving the growth of the high-skilled global service sector. This growth process then led to a further divergence between growth experiences across states. However, this also leads to further divergence in the intra-state development experience. Since several Indian states focused on high skill employment as opposed to labor-intensive job creation, this stalled movement of labor out of rural areas. The rising disparity incomes between rural and urban areas and the rise in the informal, low-skilled service sector employment relative to more formal employment was one of the negative consequences.

2.2.1 Characterizing ST by Development Process Adopted

To capture the disparate structural transformation processes that caused subnational divergence and hence discuss its implications for food systems looking ahead, we classify states into three categories—*agriculture-led growth states, urbanizing states* and *lagging states*. To identify which states belong in these categories, we use three major outcomes in the structural transformation process. The first outcome that is used in the state classification is GDP per capita. In our model GDP per capita represents both income levels and the productivity of individuals. We classify states into

Table 2.2 Classification of states

Typology	*Agriculture-led growth states*	*Urbanizing states*	*Lagging states*
Criteria	Low urbanization rates and high GDP per capita share of agriculture are relatively high	High urbanization rates and high GDP per capita share of agriculture are reducing	Low urbanization rates and low GDP per capita and low productive agricultural sector drive growth
States	Punjab, Haryana, Andhra Pradesh, Himachal Pradesh	Kerala, Goa, Maharashtra, Tamil Nadu, Gujarat, Karnataka, Telangana, Uttarakhand	Bihar, MP, UP, Odisha, Jharkhand, Chhattisgarh, West Bengal, Rajasthan, J&K, northeast states

high GDP per capita or low GDP per capita depending on whether they are above or below the average state GDP per capita across the country. The second outcome we use is the share of agriculture in GDP. A high (or low) agricultural share in GDP (compared to the mean) represents the relative importance of the agricultural sector in contributing to economic development within the state. The third outcome measure is urbanization rates. A high (or low) rate of urbanization represents the relative importance of the non-agricultural sector in contributing to GDP growth. Combing these three outcome measures, we classify states into the three categories (as shown in Table 2.2). We classify states with high GDP per capita, where agriculture continues to remain an important contributor to GDP growth and low urbanization rates as *agriculture-led growth states*. We classify states with high GDP per capita and high urbanizing rates as *urbanizing states*. Finally, in places with low GDP per capita and low rates of urbanization, we classify states as *lagging states*.

In line with our description in the previous section on the subnational growth experience, in *agriculture-led growth states*, a high productive agricultural sector, stimulated by the introduction of the Green Revolution, is the engine of economic growth. These economies were among the first to adopt new technologies for staple crop production. This led to an increase in their agricultural productivity and production and played a key role in transforming their economic landscape. While the Green Revolution played an important role in creating a sizeable agriculture surplus, some of these states have not reinvested the same in the non-agricultural sectors. This explains the relatively low urbanization rates. States such as Punjab, Haryana, Himachal Pradesh and Andhra Pradesh represent this development paradigm.

The second group of states in our model are the *urbanizing states*. In these states, economic development started with the Green Revolution. Many of these states were either able to reinvest surpluses created during their Green Revolution or were able to attract investments of surpluses from neighboring states into the development of their non-agricultural sectors. For example, Delhi attracted much of the agricultural surplus investments from Punjab, while Telangana was able to redirect agricultural surpluses from Andhra Pradesh's Green Revolution for its development. Alongside these changes, investments in human capital development, aggressive infrastructure development policies, rapid urban agglomeration and other non-agricultural development policies also paid off. In some of these states, growth has been driven by the manufacturing sectors, while in others a high-skilled service industry has been the major driver of growth. Examples of such states would include Maharashtra, Tamil Nadu, Gujarat, Uttarakhand, Karnataka, Telangana.[6]

The last category are the *lagging states*. Due to the technology unsuitability in these regions, many of these states did not see the widespread adoption of Green Revolution HYV seeds when it was first rolled out in the 1970s. In the next phase of the Green Revolution, dominated by cash crop production, price policies for staple production distorted incentives to diversify into non-staple agricultural production. Thus many of these states were not able to take advantage of the comparative advantages they had in the production of non-staple crops. As a result, they continued to rely on a low productive agricultural sector to drive their structural transformation while other states forged ahead. In the absence of strong non-agricultural development policy, urbanization rates remained low relative to other groups as well. States such as Bihar, Rajasthan, Madhya Pradesh, Orissa, Uttar Pradesh, Jharkhand, Chhattisgarh and Jammu and Kashmir belong to this category.[7]

[6] A caveat for this classification is that there exists a lot of inter-group variation in the ST experience of states. For example, the factors that led to Tamil Nadu's growth are different from the factors that led Kerala to become urbanized. Similarly, agriculture-led transformation in Punjab is dominated by staple crops, but cash crops can better explain Himachal's progress towards ST. However for the sake of parsimony, we bundle states together. This allows us to capture the broad historical experiences of states as well as identify some major trends by group as we look ahead. As we move forward, researchers would have to develop state-specific policies that reflect on the various trends within states. We leave this exercise to the future academic researchers and policy makers.

[7] In this chapter, states from the North east are included into the 'special category states' classification since this region received concessions on central taxes and financial redistributions in order to develop their institutions and economies. While we acknowledge that there is a lot of variation between these states in terms of the ST experience, their

2.2.2 *An Empirical Exercise on Characterizing ST in India*

In Table 2.3, we see the outcomes of the different development process mentioned in the previous section. In the table, we regress state GDP per capita on a number of fixed effects controlling for lags (up to five years). In this model, the province fixed effects control for differences in institutions and other time invariant factors that were common within the province. The time fixed effects account for changes in access to technology or politics and so on that may have impacted states differently over time. In column 1 (and 3), the constant term represents the annual year-on-year increase in GDP per capita (and percentage change) over time that is exogenous to these changes. It shows how much faster growing states increased their GDP per capita over time. This inequality increasing feature of states economic growth patterns is reflected in Fig. 2.3, which compares differences in the way that state transformed between the 1960s to recent times. From column 2 onward, we introduce two more fixed effects. First, we divide up the year variable into decadal dummies. These dummies represent the different timelines of the planning committee of India within which they introduced different technologies and policies to facilitate ST in India. In the 1960s and 1970s (D1 & D2), for example, the main policy focus was on building agricultural systems. In the 1980s (D3), small industry development became a national focus. In the 1990s (D4), trade liberalization and deregulation became the main focus of development strategies. In the 2000s (D5), the high-skilled service sector, facilitated by the internet technology boom across the world became a key driving force. Since the main focus of policy kept changing between these decades, the additional variation from the changing institutional context we feel is captured by adding these dummies. Second, to capture the differential effects of policy on state-wise development, we then interact the decadal dummies with the type of ST that has come to characterize state-wise development. In columns 2 and 4, our preferred specifications, we include a full set of interactions that account for both the development experience of the state and the decade fixed effects. As one would expect, states with ST led by agriculture greatly benefited from the early changes made during the Green Revolution. These states

economies remain weak compared to the rest of the country. This makes them comparable in outcomes to the *lagging states*. Thus, in other chapters, figures or tables, where there is no data on these states, the experience of *lagging states* will be assumed to represent their experience as well.

Table 2.3 Per capita growth over time

Variables	*(1)*	*(2)*	*(3)*	*(4)*
	NSDP PC	*NSDP PC*	*Log NSDPPC*	*Log NSDPPC*
Lagging × D1	5,064**	−731.2*	0.379*	0.301
	(2,147)	(375.9)	(0.190)	(0.212)
Lagging × D2	−925.0	−1,515**	−0.0772	−0.0317
	(3,159)	(594.0)	(0.134)	(0.120)
Lagging × D3	−2,523	−440.6	−0.0888	−0.0818
	(2,212)	(323.7)	(0.115)	(0.0992)
Lagging × D4	−4,051**	−228.1	−0.0136	−0.0196
	(1,917)	(326.4)	(0.0986)	(0.0774)
Lagging × D5	−4,242	−365.6	0.208	0.277
	(3,429)	(447.2)	(0.233)	(0.196)
Lagging × D6	−6,598	−251.3	0.260	0.357
	(5,449)	(757.6)	(0.251)	(0.216)
High Ag × D1	8,276*	−1,156**	1.174***	1.467***
	(4,405)	(427.2)	(0.271)	(0.171)
High Ag × D2	7,324**	−1,527**	0.949***	0.798***
	(3,072)	(570.1)	(0.127)	(0.128)
High Ag × D3	9,178***	−593.2	1.035***	0.855***
	(1,994)	(368.3)	(0.0949)	(0.0957)
High Ag × D4	13,859***	78.72	1.129***	0.936***
	(2,606)	(741.6)	(0.0811)	(0.0872)
High Ag × D5	28,789***	1,489**	1.255***	0.917***
	(4,262)	(685.1)	(0.237)	(0.195)
High Ag × D6	42,487***	1,674	1.308***	0.875***
	(6,915)	(1,183)	(0.247)	(0.255)
Urbanizing × D1	−12,164	2,463***	0.623***	0.911***
	(9,068)	(839.5)	(0.147)	(0.214)
Urbanizing × D2	−13,782	2,897***	0.480***	0.788***
	(11,472)	(838.4)	(0.144)	(0.169)
Urbanizing × D3	−9,961	3,056***	0.534***	0.807***
	(9,142)	(651.7)	(0.126)	(0.165)
Urbanizing × D4	1,314	5,274***	0.581***	0.855***
	(4,528)	(1,394)	(0.148)	(0.145)
Urbanizing × D5	23,021***	5,781***	0.804***	0.773***
	(2,421)	(910.8)	(0.164)	(0.174)
Urbanizing × D6	58,910***	8,817***	1.016***	0.638**
	(7,312)	(2,176)	(0.211)	(0.277)
Constant	52,464***	4,005**	10.21***	9.834***
	(4,379)	(1,523)	(0.191)	(0.276)
Observations	1,340	1,188	1,340	1,188

(*continued*)

Table 2.3 (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*
	NSDP PC	*NSDP PC*	*Log NSDPPC*	*Log NSDPPC*
R-squared	0.909	0.989	0.917	0.936
State FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Decade FE	YES	YES	YES	YES
Lags	NO	YES	NO	YES
Robust SE	YES	YES	YES	YES

Robust standard errors in parentheses—clustered by state, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$
NSDP PC—National State Domestic Product per capita, Log NSDP PC—log values of NSDP PC—represents year-on-year growth
High Ag—high agricultural productive states, Spl Cat—special category states; *lagging states* are the baseline comparison groups
FE—refers to fixed effects, lags—include five lags for NSDP PC values

grew around 14% each year in the first decade and then around 8% on average every year. *Urbanizing states*, which diversified out of staple grains and agriculture, grew steadily around 9% year on year over the entire time. *Lagging states*, which focused their agriculture on staples on the other hand, grew very slowly in the first three decades. Much of their 2–3% growth has come from the post-liberalization times.

2.3 Transition from the Agriculture to the Non-agricultural Sector: Frictions and Search Costs in Labor Markets

During the process of ST, economic growth brings new employment opportunities in the fast growing non-farm economy (Johnston & Mellor, 1961). As the number of opportunities to engage in the non-farm rural sector increases, many opportunities for employment and growth also come to situate themselves in urban agglomerations such as peri-urban areas, towns and cities. Agglomeration of skills and capital in these urban units are known to speed up the process of growth, thus pushing up urban wages faster than rural wages. Hence, historically, it has been common to see large numbers of people migrating from rural to urban areas to avail the benefits of this growth (Barrett, Christian, & Shiferaw, 2017; Johnston, 1970; Johnston & Mellor, 1961; P. Pingali, 2010).

In India, while cities have grown in size and economic opportunities have increased, an important criticism of the ST process is that there has been a very low rural to urban migration rates in response to these changes. The employment share of agriculture in total employment has not fallen as fast as the decrease in the value added of agriculture in GDP. In line with this observation, migration data from the census 2011 reveals that rural to rural migration has dominated patterns for working age males. The major occupational choice for these types of migrants are agricultural laborer-related jobs, which explains why agricultural share in labor remains high even though India has undergone structural transformation. Rural to urban migration, often characterized by the transition of jobs from the agricultural to the non-agricultural sector, has been increasing, albeit too slowly (Fig. 2.4). This is in spite of the fact that urban unemployment continues to remain high and increasing demand for urban services continues to drive up wages (Binswanger-Mkhize, 2013; Munshi & Rosenzweig, 2016).[8] To explain this conundrum, in this section, we propose explanations on the market dynamics and illuminate the different search or entry costs that have impacted labor markets and hence migration patterns in India. In a future chapter, we highlight the micro-level constraints involved for income diversification of households.

2.3.1 The Push and Pull of Migration in Response to Disequilibria in Labor Markets

We classify labor markets in India into those for low skills and those for high skills. The low-skilled labor markets in India are characterized by lower human capital investments in education. Sectors such as agriculture, construction, mining and low value added industries and (non-agricultural) services determine the labor demand. In the absence of signals for worker quality, which generally come from education, social networks play an important role in reducing search costs. Social networks also help reduce monitoring costs and costs of contract enforcement

[8] Many peri-urban areas continue to remain classified as rural based on a hard and fast census classification for urban areas. Experts who tend to use these census definitions tend to underestimate the amount of urbanization in the country, and hence migration rates at best underestimate the true migration rates between rural and urban areas.

for employers in these low-skilled labor markets. In high-skilled labor markets, firms from sectors such as finance, medical care, education and research and technology development determine labor demand. Entry costs, reflected by costs of accessing good quality education, restrict labor supply and the total skills available for firms to access. In these markets, social networks play a smaller role in determining employment opportunities. Firms instead rely on observable worker quality, experience working in other firms and educational levels of individuals as credible signals in the hiring process.

All states in India have some combination of these markets depending on their level of ST. In Tamil Nadu and Gujarat, firms demanding high-skilled labor can be found in both urban and semi-urban areas. Higher levels of ST in these states create demand for both high-skilled and low-skilled workers in urban areas. This creates the pull factor for labor out of agricultural jobs and out of rural areas. In order to replace these outmigrants, wages in rural areas increase to attract new labor. This creates a pull for able-bodied and productive migrants from other states where rural labor markets may be depressed due to economic conditions. In states such as Madhya Pradesh and Orissa, the low-skilled labor supply is large, but employment opportunities outside the local labor market may not exist due to low worker productivity. In these states, migrants from rural areas will often participate in low-skilled labor markets closer to their homes. Thus, these various factors contribute to four internal migration patterns documented in the Indian census (Table 2.4).

The first type of migration is the rural to rural (R2R) transition, which records the percentage of individuals who transition between rural areas of residence from one census survey to the next. The second type of migration is rural to urban (R2U) migration. This migration reflects the movement of individuals from rural residences to urban residences. According to the labor market theories, during ST, greater urban growth, driven by growth in the non-agricultural sector, is expected to stimulate demand for this type of transition. The third and fourth types of migration pattern are the urban to urban (U2U) and the urban to rural (U2R) migration. For the former, high levels of urbanization both between and within states determine migration patterns. For those migrating from urban to rural areas, age and gender

Table 2.4 Migration patterns over time

Year	*Group*	*Rural to rural*	*Rural to urban*	*Urban to rural*	*Urban to urban*
1971	Male	53.2	26.6	6.4	13.8
	Female	77.6	10.7	5	6.7
	Total	70	15.6	5.5	8.9
1981	Male	45.6	30	7	17.4
	Female	73.3	12.5	5.6	8.6
	Total	65.2	17.6	5.9	11.3
1991	Male	43.43	31.6	7.2	17.8
	Female	76.5	8.4	5.8	9.3
	Total	67.2	13.9	6.2	11.7
2001	Male	36.4	34.2	6.3	23.1
	Female	72.3	13.5	4.2	10
	Total	62.9	18.9	4.8	13.4
2011	Male	33.9	30.2	7.1	28.8
	Female	64.0	15.7	5.2	15.1
	Total	54.9	20.1	5.8	19.3

Source: Singh et al. (2011), census 2011

play a major role. This type of migration is dominated by older aged individuals migrating for retirement and by women migrating for marriage. Within states, the level of ST and proximity to urban centers can influence migration patterns. For example, locational advantages such as proximity to Delhi explain greater R2U migration for work related employment from Haryana. High urbanization, low migration costs and the promise of high incomes per capita encourage the inmigration of low-skilled workers from neighboring states. R2R migration patterns would be larger in *lagging states* like Bihar. Low urbanization rates and low incomes per capita reduce incentive for rural to urban migration in favor of rural to rural migration. Individuals are more likely to move between rural areas within the state. U2U migration patterns would be larger for *urbanizing states* like Maharashtra. High rates of urbanization, greater access to the global economy and more opportunities for urban-oriented economic growth create the impetus for driving the migration of both high-skilled and low-skilled individuals towards its urban areas (Census Report, 2001, pp. 23–24).

2.3.2 *Explaining High R2R Migration Rates: Moving Low-skilled Agricultural Labor Between Low and High ST States*

In 2011, nearly 55% of total migration involved individuals moving between rural areas of India. These transition patterns tend to dominate the migration story of India and are often used to drive home the point that ST processes have not been sufficient in India. In this section, we argue instead, embedded in the macro statistics are the pull factors created by low-skilled agricultural labor markets in high ST areas vis-a-vis low ST areas. In high ST states, for example, increase in productivity of agriculture has driven up the labor costs of low-skilled agricultural laborers (S. Bhalla, 1979). In response to these pull factors, labor from low ST areas migrate towards job opportunities in these agricultural labor markets.

There are two reasons for a migrant from a low productive agricultural labor market to move to a high productive but low-skilled agricultural labor market. One, as long as the expected wages at the destination are higher than their current wages, migrants will prefer to move between labor markets that maximize their wages given their skills, knowledge and preferences for work (Fields, 2011; Harrison & Leamer, 1997; Lipton, 1980). Other factors that influence the cost of migration such as proximity to home town or linguistic and ethnic proximity to members at the destination can influence both where the individual may choose to migrate as well as how long they choose to stay (Harris & Todaro, 1970; Todaro, 1969). These costs also differ based on educational qualifications, the strength of social networks and opportunity costs of migration (Fields, 1975; Lipton, 1980). High intra-district figures and high rural to rural migration may thus reflect rational responses of migrant households to local labor market frictions rather than failed outcomes of urbanization or ST. In low-skilled agricultural labor markets, wages are higher in high ST states than low ST states as evidenced from the literature (Fig. 2.7). As a result, workers from low ST areas migrate into agricultural markets in high ST states. In 2001 migration census report, migration from Bihar (0.14 million) and Uttar Pradesh (0.24 million) dominated inmigration figures to Punjab. Work employment was cited as the main reason for migration by male migrants from UP (72.1%) and Bihar (82.2%).[9]

[9]While one would ideally like to have migration transition probabilities between states by sector, this data is not available. However, it is reasonable to assume that rural to rural migration rates from Bihar to Punjab are higher than rural to urban migration rates between these states.

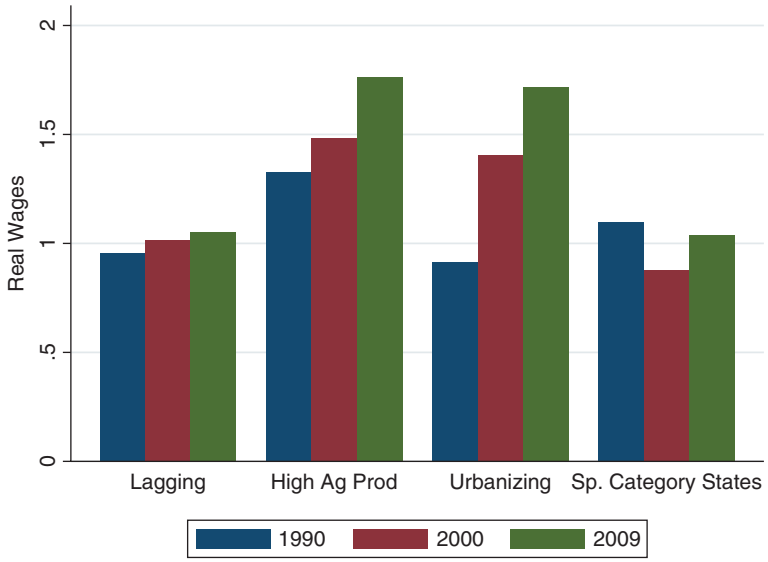

Fig. 2.7 Agriculture wage differentials by state classifications. Source: ICRISAT VDSA meso-level data; based on authors calculations

2.3.3 Explaining Low R2U Migration Rates: Illuminating Frictions That Affect the Speed of Transition

Urban markets are thought to house non-agricultural production centers that grow during ST. The ST theory predicts that non-agricultural sector growth, represented by greater urbanization and industrial growth, creates the major pull factors for migration out of rural areas. Thus ST is expected to bring with it high rural to urban migration rates (B. Bhattacharyya, 1985; Fields, 1975, 2011; Lipton, 1980; Todaro, 1969; Zhang & Song, 2003). In India, both urbanization, as well as wage differentials between urban and rural markets, have been increasing with ST. In response to these changes, one would expect that there would an increase in the R2U migration rates. However, based on census migration data, we see that R2U migration statistics has been increasing rather slowly. Experts have argued that even though 30% of India reports migrating over ten years, most of the migration is by women moving for marriage and males moving for employment within

their districts.[10] Temporary migration, a situation where individuals may enter urban labor markets for six or fewer months, has been the defining feature of this type of migration (Bhagat, 2017; Kone et al., 2016; Mitra & Marayama, 2009; Pandey, 2014; Tumbe, 2014). Low R2U migration in the presence of high wage differentials and unemployment represent a contradiction to the expected growth process as determined by ST.

At the micro level, experts have highlighted the role of language, caste, religion and age in explaining the phenomena of high rates of temporary migration of low-skilled workers and low occupational mobility in urban areas (Munshi, 2011; Munshi & Rosenzweig, 2006, 2016). In China (Rozelle, Taylor, & DeBrauw, 1999) and Mexico (Taylor & Wyatt, 1996), authors find that poorly defined land rights often prevent laborers from selling their unproductive lands and moving out of agriculture. The literature also finds that proximity to urban areas also plays a role in determining migration outcomes. Urban infrastructure constraints also impose costs on permanent migration since land costs in urban areas are extremely high (Bhagat, 2017; Imbert & Papp, 2014; Pandey, 2014). These entry costs along with poor human capital development add to labor market frictions and reduce incentives for workers from rural areas to respond to urban labor market demand. If the probability of finding a job is low due to lack of information, this will discourage rural to urban migration in the presence of urban unemployment and rising wages (B. Bhattacharyya, 1985; Fields, 2011; Lipton, 1980).

At the macro level, low levels of ST in states or low growth of the non-agricultural sectors reduces pull factors that are essential for migration to take place. Looking at the data on the migration probabilities between states, one sees that geographical proximity of *urbanizing states* determines migration patterns. In 2001, Maharashtra saw the greatest increase in migrants with over 3.2 million people entering the state. Of those migrating, 81% moved into urban areas. Delhi welcomed an additional 2.2 million people. Much of the migration to these *urbanizing states* came from *lagging states*. More than 70% of male migrants to these states reported that they migrated for work and employment.

[10] Urban population growth doubled between 1901 and 2001, then increased 8% between 2001 and 2011. This growth has come from (1) high urban fertility rates (around 2.0), and urban fertility has reached this level only recently. Till 2001 it was above 2, which meant that urban population growth was driven by those living in urban areas. (2) Migration to cities—this has been a smaller portion of the total urban growth for now. However, it will change soon as migration has urban fertility rates that have fallen below replacement rates in 2011.

2.3.4 Changing Demographic Structure and Its Impact on Rural Productivity

In India, outmigration is characterized by welfare reducing factors at the point of origin. Overall, highly educated, young, productive and rich male individuals migrate first followed by their nuclear families (Census, 2001; Kone et al., 2016; Pandey, 2014; Tumbe, 2014; Zhang & Song, 2003). Reverse migration or the process of moving from urban to rural areas also contributes to changing the socio-demographic profile of villages for those left behind (Census, 2001). Among those participating in U2R migration, marriage is the largest driver of female migration and old age is the largest driven of male migrants. Thus outmigration of young workers and inmigration of women and older individuals create a village economy characterized by older age individuals and women and children. These groups are then expected to manage the farm and hence drive the rural economy. In Munshi and Rosenzweig (2016), authors show that outmigration greatly impacts the strength and wealth of the social network, increasing vulnerability of those who are left behind. Migrant remittances are often used to pay back the debt incurred for helping a family member migrate or in replacing farm labor with automated tools of production. Desai and Banerji (2008) show that women who are left behind exhibit independence and better empowerment indicators only if they do not already live with an extended family. Living with extended family decreases their agency in supporting the household.

In such situations, there are three important things to note. One, over time, women and older individuals often become an important part of the labor force in agriculture in rural areas. In the last census, the female to male ratio of women working in the agricultural sector had increased both over time and with greater amounts of GDP per capita. Figure 2.8 reiterates the importance of focusing on increasing agricultural productivity of women to stimulate rural growth in the future. Two, without access to financial markets to invest gains from migration or non-agricultural markets to spend their cash on, rural economies may not benefit from net migration. Thus investments in increasing access to banks or other savings instruments will be important for stimulating investments and hence growth in the non-farm rural sector. Three, as rural fertility remains high and child mortality continues to reduce, there is bound to be an increase in the number of young individuals who will become eligible to participate

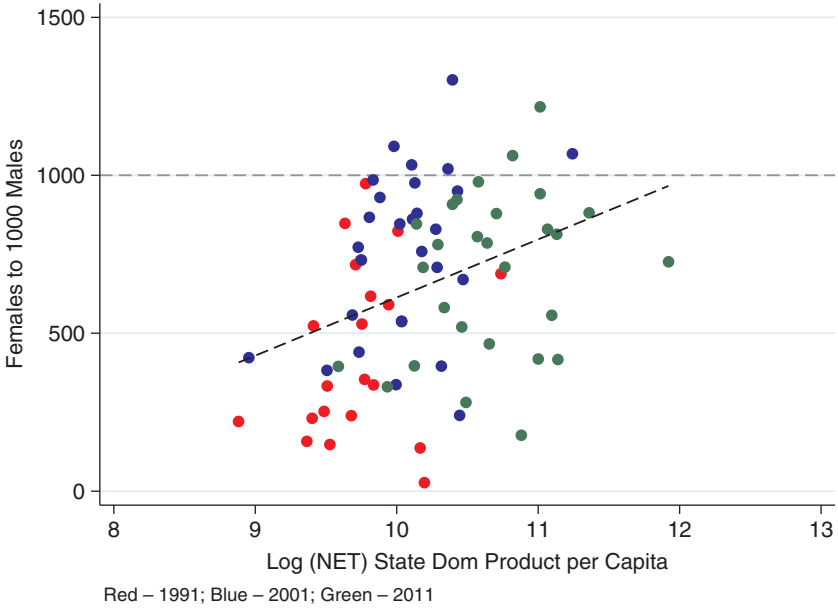

Fig. 2.8 Growing participation of women in agriculture. Source: Census 1991, 2001 & 2011; based on authors calculations

in the labor markets over time. Lack of access to proper education or health facilities due to poor rural infrastructure and poor access to nutrition will reduce the productivity of the future labor force. This will reinforce the existence of a low productive rural economy, thus impacting future efforts towards stimulating greater structural transformation.

2.4 Conclusion

As of 2018, India has become the sixth largest economy in the world displacing France from this position. The emergence of the country on the global stage is evident in its growing per capita incomes and its emergence as a global economic and thought leader. However, India's growth experience has been marred by subnational divergence. This has led to the emergence of states like Goa and Delhi whose development experiences compare to high growth countries in Latin America, while states like Bihar and Uttar Pradesh are now more comparable to some of the low-income

countries in sub-Saharan Africa. In the former, development is driven by a high growth urban economy, while the latter's development is weighed down by a low productive agricultural sector.

In this chapter, we deliberate upon the reasons behind the divergent subnational growth experience. Overall there are four major takeaways. First we find that the Green Revolution, which played an important role in catalyzing economic growth in many states across the country, did not benefit all states. States (currently *lagging states*) which did not have any comparative advantages in the production of rice and wheat have been left behind in the development process. Instead, those states that have built their agricultural sectors on comparative advantages such as ease of access to global markets, agro-climatic advantages, high-skilled farm capacity for production have been the ones to benefit from technology advances of the Green Revolution. In many of the fast growing states, agricultural value added and agricultural productivity remains high and continues to grow, reiterating the role of a productive agricultural sector in supporting the growth process. In *lagging states*, staple-grain-focused agricultural policies and rigid procurement policies lock small farmers into staple grain production even when they have no comparative advantages in its production. The lack of documentation of landownership and the increase in fragmentation of land have also been linked to poor investments in productivity-enhancing inputs, thus leading to low yields. This creates a vicious cycle of low yields and low returns to farming and keeps small farmers in their subsistence mode of production especially in *lagging states*.

Second, our analysis of the development process reveals that serendipitous changes in national (aggregate) demand (pre-1990s) or global demand (post-1990s) and the readiness of states to direct their economic sectors to respond to this demand have been the key ingredients in propelling them forward. States that have been more flexible in their development approach, focusing on developing industries in which they have comparative advantages in resource availability, have been more successful in enabling greater ST. In *urbanizing states*, even though the Green Revolution provided the impetus for growth, development strategies that have focused on comparative advantages, in skill and infrastructure availability, rather than absolute advantages, say in availability of land, have proved successful for ST. Thus national policies that keep states locked into a single type of development strategy have now become high-risk strategies. Even states focused on *agriculture-led growth* need to actively

redirect their economies to benefit from global opportunities for growth based on their comparative advantages in high-value crop production, for example. In this regard, investment strategies that increase the productivity of resources are important towards ensuring long-term development.

Third, embedded in our discussion on the macro factors that impact growth is the assumption that if economies are to structurally transform, a robust non-agricultural sector will be needed. The non-agricultural sector creates the pull factor that helps redirect underemployed agricultural labor from low productivity to higher productivity jobs. This non-agricultural sector growth can come from the non-farm rural sector as well as urban areas. While we discuss this in more detail in Chap. 3, in this chapter, we argue that reducing labor market frictions will increase participation in the non-farm (or non-agricultural sector) and is key to facilitate faster ST. This involves reducing search costs and entry costs into rural and urban non-farm labor markets. For example, we identify that human capital investments reduce both search and entry costs and are needed for greater occupational mobility. Additionally, information about labor market returns, increasing safety in the workplace and access to role models who come from the same caste and community can also be important inputs into reducing barriers to entry. Four, a major trend that we see emerging for the future is the growing importance of women in the agricultural sector. On-farm labor-saving technology which enhances productivity and reduces drudgery is essential for kickstarting a Green Revolution 2.0, especially in low productive regions. However, technology adoption can enhance on-farm productivity only if it accounts for issues of access that are impacted often by gender, poor education, lack of land tenure rights or lack of access to financial markets. These labor market frictions need to be addressed through appropriate rural development and human capital enhancing policies.

Looking ahead, we see three important drivers for economic growth that will impact the speed of ST within the country. First, recent research has shown that climate change has created a non-trivial threat to future production. Studies have already documented the negative effects of temperature and rainfall shocks on agricultural productivity, labor productivity and health of individuals within the country (Majra & Gur, 2009; E. Somanathan & Somanathan, 2009). This poses a major challenge for development policies as there is expected to be regional disparities in the intensity of impacts due to climate change. Thus economic policy needs to simultaneously invest in creating comparative advantages for growth while

reducing greenhouse gas emissions through appropriate climate change mitigation policies. Second, extrapolating on the current demographic and migration trends from the country, we see that over the next 30 years, a greater number of young Indians are expected to enter the workforce. However only healthy individuals will have the ability to participate in growth processes to their full capacity. Also, current trends in industry growth indicate the growing preference of mechanization and labor-saving technologies in production processes. Creating a clear pathway for young people to benefit from economic growth opportunities that a mechanized ST process brings with it, which, simultaneously addressing the human capital challenge of better nutrition and health, will be an important policy commitment. Three, rapid urbanization of population poses a major challenge if it is not inclusive of the rural growth. Looking ahead, tying rural development to urban food growth requires policy innovations in agricultural development, food supply chains, food safety nets and non-farm economic opportunities. These commitments will be important towards ensuring the long-term sustainability of economic development processes.

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