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Abstract

Over the past 50 years, the structural change in the Indian economy and its agriculture have been slow (Binswanger and D'Souza, 2012).The divergence of productivity of labor between the nonagricultural economy and the agricultural sector is still widening, and so is the difference between the share of labor in agriculture and the share of agricultural output in the economy. A turning point where the productivity differential and the differences in labor and output share of agriculture start declining is not close at hand. In agriculture, economic growth has shifted consumer demands away from cereals, pulses and oilseeds towards horticulture and livestock products that have much higher income elasticities. In this paper we briefly review these national trends and then extend this analysis to the state level.

Economic growth rates among the states have recently started to converge, rather than diverge, and the association between the state per capita income and its economic growth rate, that existed prior to the economic reforms of the early 1990s, has disappeared. Therefore the outlook for poorer states now appears to be much better. The relationship between initial poverty and current agricultural growth has also disappeared, and it is the middle income states that have been growing the fastest over the past two decades.

Out of 15 states, six are now experiencing convergence of the share of the agricultural labor force with the share of agricultural output: Kerala, Punjab, Haryana, Maharashtra, West Bengal and Tamil Nadu, with convergence still very slow in the last two states. The factors behind the convergence differ among the states, as discussed in the paper. It is clear that structural transformation has started in India, but is not yet generalized.

In the early 1990s the economic and agricultural production structures already differed strongly among 8 major states that we examine more closely. The share of agriculture declined in all states while the share of services increased in all of them. It is disappointing to

find that the share of manufacturing grew only in Punjab, whereas elsewhere it declined, and even in Punjab it grew only by one percent. The share of other industries had no common trends, going up in some states and down in others. In agriculture, the only common trends across states in the composition of output are the declining shares of cereals and of pulses. However, which sector experiences rising shares differs widely among states, although diversification is generally into higher valued commodities. These differences are more likely related to changing inter-regional trade opportunities and changing comparative advantage than to rising income. Finally we summarize a recent study of the agricultural growth performance across four states and its recommendation, and also review recent work on why Gujarat's agriculture has done exceptionally well for over a decade now, that could serve as an encouraging model for the necessary acceleration of agricultural growth in other states.

1. Introduction

In spite of rapid economic growth in the last two decades, structural change in the Indian economy has been slow and atypical. While economic growth has accelerated sharply, agricultural growth has badly lagged behind. Nevertheless, as a share of GDP, agriculture has declined sharply, manufacturing has remained at a low and fairly stable share, while services have increased sharply, followed by industry (other than manufacturing). As a consequence labor has moved from agriculture to the nonagricultural sectors, but rather than finding good jobs in the urban economy, the workers have moved to informal sector jobs and self-employment in the vibrant rural non-farm sector, producing what we call a stunted structural transformation (Binswanger, (2013) and Binswanger and D'Souza, (2012)).Rising per capita incomes have increased food demand. The share of livestock in production has increased since 1971 while that of horticulture has increased since 1990. Since the late 1960s the shares of pulses and oilseeds, and of other crops have declined steadily as well. Until around 1996 the share of cereals was the highest at around 35 percent but has declined rapidly since then as a consequence of the accelerating income growth (ibid). In this paper we first set the stage by summarizing what we have learned about structural transformation at the national level. We then proceed to answer the following questions.

1. Has there been convergence between initially low income and high income states in the economy-wide and agricultural growth rates? (Sections 3 and 4)
2. Have some states been able to reach the turning point in structural transformation where the ratio of agricultural and non-agricultural share of output and its share in the labor force started to converge? (section 5)
3. How do states vary in the evolution of the sector composition of the economy? (Section 6)

4. How do states vary in the diversification of agricultural output? And what are the drivers of diversification at the state level, rather than at the national level? (Section 7)
5. Can agricultural growth be accelerated by states learning from each other? More specifically, how has the state with the highest agricultural growth performance, Gujarat, achieved it, and is that experience transferrable to other states?(Section 8)

2. The stunted structural transformation of the Indian Economy: 1960-2012

As an essential background to the state level analysis we summarize our recent analysis of structural change at the national level.Compared to international experience, the structural transformation in India has been slow and atypical. The share of manufacturing has stagnated at a low level. At the same time the share of the agricultural sector in GDP has declined sharply, and the remaining industrial sectors and services have shown growing GDP shares. Absorption of labor in the urban economy has been slow, and has gone mainly into informal employment where there are no job security and benefits. Rural-urban migration has been far less than could have been expected in a rapidly growing economy.

Rural population and the labor force are continuing to rise rapidly, on account of population growth and of the slow rural-urban migration. The literature on structural transformation shows that in currently developed countries the share of GDP in agriculture declined during the transformation, while the share of manufacturing and other industries rises. The share of agricultural labor initially stays high or declines slowly, and declines more sharply in the later phases of the economy. The difference between the share of agriculture in the economy and its share in the labor force initially rises until the Lewis turning point is reached and then starts declining rapidly (Lewis 1954). The difference between agriculture's share in output

and its share in the labor force is therefore a commonly used indicator of structural transformation (Timmer, 2009). The productivity differential between labor productivity in urban and rural areas already exists before the transformation, but then widens sharply, again until the turning point is reached, after which rural labor productivity starts to catch up. As a consequence of the productivity differential, throughout the structural transformation labor migrates from agriculture for better job opportunities. As long as there is abundant labor in the rural areas, this migration does not raise economy-wide and rural wages. It is when the Lewis turning point has been reached that these wage rates start to rise.

Over the past decades the differences between output and labor share of agriculture has widened significantly in India, suggesting little structural transformation. While since the early 1990s economic growth has accelerated significantly, the agricultural growth rate failed to accelerate. As a consequence of high nonagricultural growth, low agricultural growth, and growth of the agricultural labor force, the ratio of labor productivity in the nonagricultural sector and the agricultural sector has widenedat an accelerating rate to 4.2. The two indicators show that India is not close to reaching the turning point in its structural transformation, where the shares of agriculture in GDP and in the labor force are starting to converge, and the productivity differential between the non-agricultural and the agricultural sector starts to narrow.[1]

With these trends one would expect a rising differential between urban and rural poverty rates, between urban and rural per capita incomes and consumption. However, this has not been the case. The rural poverty rate (using poverty line according to the Lakdawala methodolgy) declined from 50.1% in 1993-94 to 31.8 % in 2004-05, or by 18.3%, while urban poverty declined from 41.8 % to 25.7% percent, or by 6.1%.[2]In absolute terms the

[1] China appears to recently have reached the Lewis turning point as shown by Zhang (2011).

[2] Preliminary estimates of the national poverty rate prepared by Ravi, and cited in Ahluwahlia (2011) suggest that the national poverty rate under the new Tendulkar committee poverty line has declined further from 37.2

decline in rural areas is larger than in urban areas, but in relative terms the opposite is the case. The urban-rural income has declined slightly while the urban-rural consumption has increased modestly.[3]Thusthese data series do not suggest a sharp increase in urban-rural disparities over the past 30 years.

Why has there not been more divergence in the welfare indicators for urban and rural areas? Employment and incomes in the rural non-farm sector have been rising rapidly. *The growth of the rural non-farm sector implies that there is a structural transformation of the Indian economy whereby labor moves from agriculture to non-agriculture. However it isthe stunted structural transformation which generated few good jobs in the urban economy*.

The cause is the failure of the urban economy to create enough jobs, especially in labor-intensive manufacturing. Nevertheless the growth in the non-farm sector has prevented the rural economy from falling dramatically behind the urban economy. Rapid rural income growth will depend on continued urban growth spillovers and a significant acceleration of agricultural growth.

3. Economic Growth and inequality at the State Level

In Table 1 we extend the analysis of Birthal et al (2011) to additional years now available in CSO data. It shows the initial per capita incomes across states for the pre-reform period between 1980/81 and 1982-83, and then for the pre-reform decade of the 1980/81 to 1992/93 and the two post reform periods 1993-94 to 2004-05 and 2005-06 to 2010-11 respectively. Also shown are the annual compound growth rates in per capita GSDP for each of these three

percent in 2004-05 to 29.8 percent in 2009-10, or at an accelerated rate of about 4.3 percent per year. The rural poverty rates fell from 42 percent to 33.8 percent and the urban poverty rates fell from 25.5 percent to 20.9 percent respectively for 2004/05 and 2009/10.

[3]The ratio of urban to rural per capita income declined from 2.45 in 1970-71 to 2.30 during nineteen eighties and the first decade of this century. On the other hand, data on consumption suggest that the ratio of urban consumption to rural consumption increased from 1.54 in 1983 to around 1.70 in 2004-05 and 2009-10. Whether rural-urban income and consumption disparities have increased is therefore dependent on the data used.

periods.[4] The states have been ordered from the lowest to the highest per capita income based on their average income in the base period, the triennium form 1980/81 to 1982/83. The per capita income of Punjab, the richest state at the time, was 2.5 times that of Bihar, the poorest state but widened to almost four times in the 1993/94 to 2004/05 period. Bihar remained the poorest state, and none of the six poorest states managed to escape that status, although their ranking in that group changed. At the top the change in rankings was more dramatic, with Punjab falling out of the first group of six states, and Kerala, the sixth state initially, shooting up to number one.

Table1. Level and growth in per capita income in Indian states, at 2004/05 prices

	Per capita GSDP (Rupees)				**Annual compound growth rate in per capita GSDP (%)**		
	Average of 1980/81-82/83	1980/81 to 92/93	1993/94 to 04/05	2005/06 to 10/11	1981/82 to 92/93	1993/94 to 04/05	2005/06 to 10/11
Bihar	7747(15)	8730(15)	7546(15)	12015(15)	1.1	0.1	8.8
Uttar Pradesh	8858(14)	9938(14)	13200(14)	17489(14)	2.1	2.2	5.0
Rajasthan	9207(13)	11290(13)	17750(12)	26011(12)	4.1	3.0	6.1
West Bengal	10067(12)	11703(11)	19369(10)	30646(10)	2.4	4.9	6.0
Madhya Pradesh	10155(11)	11414(12)	18497(11)	21453(13)	2.3	2.4	6.3
Orissa	10590(10)	12096(10)	15864(13)	26169(11)	1.3	3.7	7.1
Karnataka	11073(9)	13095(9)	23116(8)	40323(8)	3.4	5.2	7.5
Tamil Nadu	11144(8)	14257(8)	27236(7)	47911(6)	4.8	4.8	9.0
All India (15	**11376**	**13185.45**	**20525.66**	**32448.87**	**2.9**	**4.0**	**7.6**
Andhra Pradesh	13276(7)	14511(7)	21894(9)	38005(9)	2.2	4.8	7.8
Kerala	14578(6)	16076(6)	27689(6)	57877(1)	2.6	5.0	12.1
Gujarat	14662(5)	17197(5)	29681(4)	51724(4)	3.8	4.4	8.3
Maharashtra	15197(4)	18204(3)	33031(2)	56997(2)	3.9	4.3	9.0

[4] Three year averages of per capita income are used to smooth out fluctuations in the annual data.

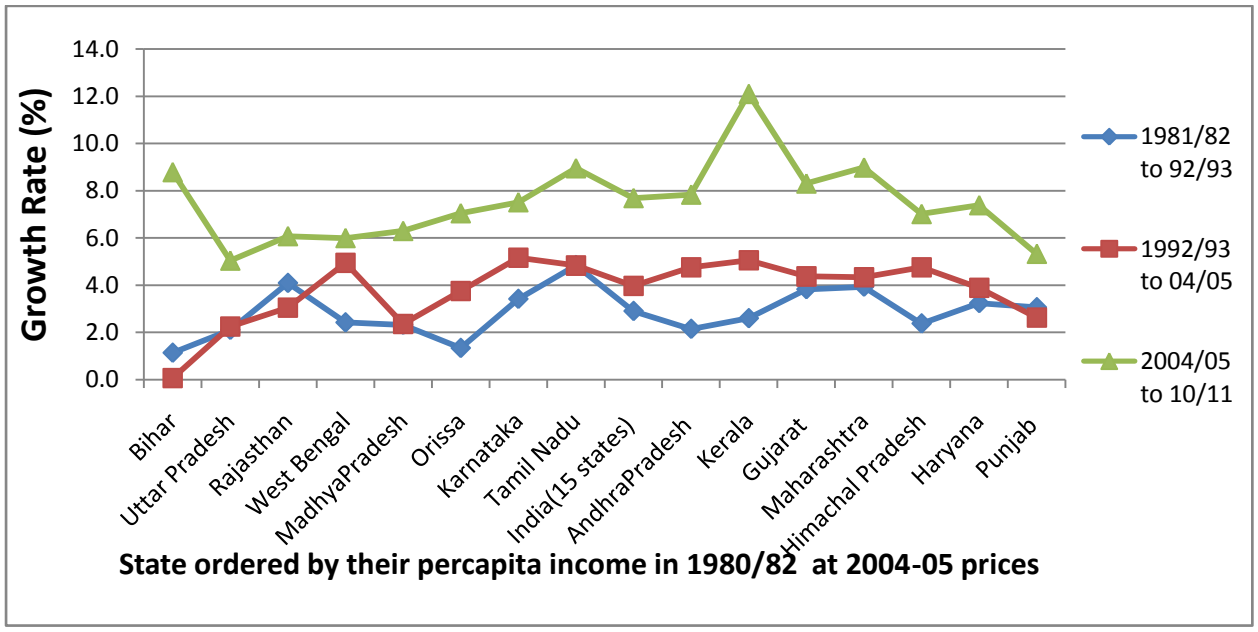
Himachal Pradesh	16218(3)	18110(4)	29168(5)	48815(5)	2.4	4.8	7.0
Haryana	18409(2)	22384(2)	33436(1)	54964(3)	3.2	3.9	7.4
Punjab	19688(1)	23044(1)	32323(3)	45345(7)	3.1	2.6	5.3

Source: CSO and Authors calculations, figures in parentheses are the ranks of the states.

In Figure 1 we plot the growth data. In the pre-reform period India's per capita growth rate was 2.9 percent, and accelerated to 4.0 percent in the second period and to 7.6 percent in the last 5 year period shown. In the pre-reform decade Rajasthan, Tamil Nadu, Gujarat and Maharashtra's per capita growth rates were above or near four percent per annum. Karnataka, Punjab and Haryana followed the lead group at around 3.5 percent. Bihar and Orissa had growth rates well under 2 percent, and all other states had growth rates between 2% and 3%. In the 1980s there was therefore a slight tendency for the richer states to grow a bit faster.

As already pointed out by Birthal et al.(2011), the big change between the pre-reform and the first post-reform period was that per capita income growth accelerated in the middle and most high income states from West Bengal, to Haryana but not Punjab. Since the 2004/05all states have seen an acceleration of their growth rates; the entire line lies well above the growth rates of the two previous periods. Kerala, Tamil Nadu, Bihar and Gujarat are showing the highest growth rates around 12, 9, 8.8 and 8.3 percent respectively, Uttar Pradesh and Punjab the lowest at 5 percent and Rajasthan, Madhya Pradesh and West Bengal around 6 percent. *For our later analysis of agricultural diversification it is important to retain that per capita income growth should have been a significant driver of diversification in all the states.*

Figure 1: Annual compound growth rate (%) of per capita GSDP



Source: Authors calculations from CSO data

Birthal et al. (2011) showed that there was absolute divergence of incomes between the states between 1980/82 and 2003/04.After controlling for structural characteristics of states, they found a strong tendency of convergence among states in the post reform period. Investment in physical infrastructure and human capital enhanced economic growth, combined with improving labour market linkages of agriculture with non-agricultural sectors, and labour-intensive agricultural technologies.

We then ran regressions of GSDP growth in each of the three periods on the initial per capita income in 1980-82.[5] We confirm the finding of Birthal et al. (2011) finding that in the pre-reform period to 1992 there was a statistically significant tendency of the initially richer states to grow faster than the initially poorer ones, but with a wide dispersion of the scatter

diagram and an R-square of only 0.1. However, in the post reform periods this association disappeared in the regressions without any other factor included. The figures suggest that in the first post-reform period it was the lowest and highest income states that grew a bit faster than the middle income states, while in the second post reform period it was the other way around. *The answer to our first question about the convergence of economic growth rates therefore is that the economic reforms not only led to a sharp rise in the growth rates across all states, but also to the disappearance of the relationship between initial income and growth. This implies significant convergence in economic growth rates across states in the second reform period.*

Ahluwahlia (2011) looks at the trends in interstate inequality of per capita gross state domestic product (PCGSDP). During the 1980s the gini ratio of PCGSDP fluctuated between 0.14 and 0.16. During the 1990s it rose sharply to reach about 0.24 in 2000-01, and then fluctuated between 0.24 and 0.26 with no clear trend. Thus the 1990s were a period of rising interstate inequality, but this tendency has not persisted since then.

4. Agricultural Growth

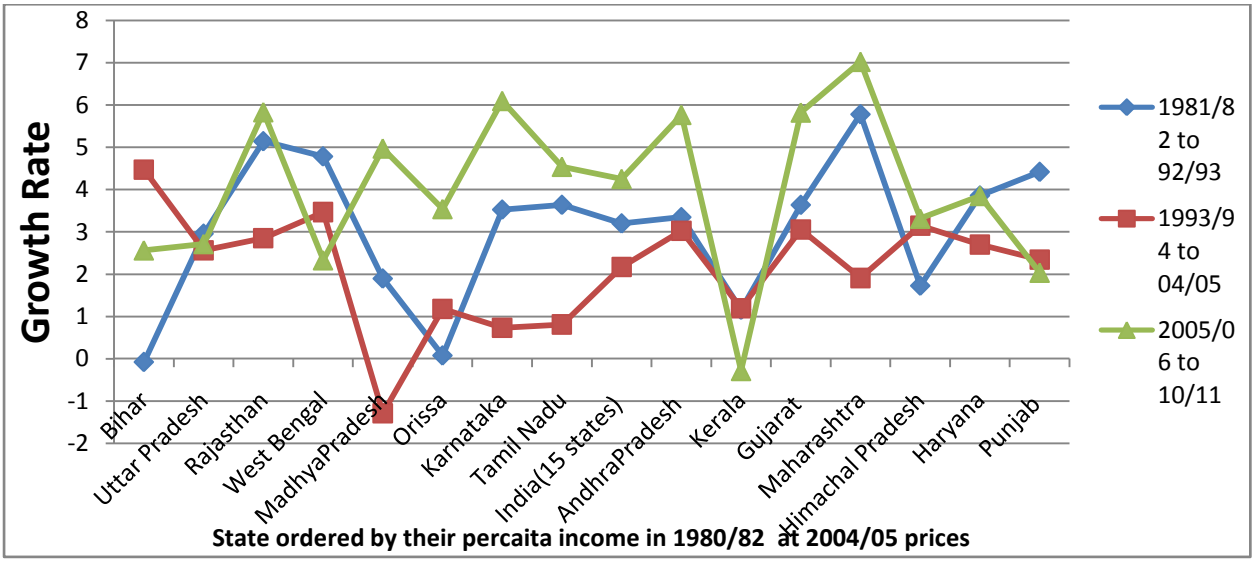
In figure 2 we plot the growth rates of agricultural GSDP (Gross State Domestic Product) in the same initial per capita income order as in Figure 1.The figure 2 illustrates the slowdown in agricultural growth of India (as measured by the simple average of state growth rates), from the pre-reform to the first post reform period, from 3.2 percent to 2.2 percent, and the sharp recovery to over 4.3 percent since 2005-06.[6]

In the pre-reform period, Maharashtra had the highest agricultural growth rate of 5.8 percent.Rajasthan, West Bengal and Punjab followed with growth rates between 4.4 and 5.1 percent. The poor states of Bihar and Orissa had growth rates near zero while Kerala

[6] National average agricultural value added grew by 3.2%, 2.2% and 4.3% in the three sub-periods.

managed an agricultural growth rate at 1.2 percent. The other states had rates in between. *In regression analysis of the pre-reform base period we founda positive relationship between initial per capita income levels and growth.*[7]

Figure 2: Growth rates of State Gross State Domestic Product from Agriculture



Source: Authors calculations and CSO

In the second post-reform period the best performers were Maharashtra, Karnataka, Gujarat, Rajasthan and Andhra Pradesh with agricultural growth rates between 5.8 and 7.0 percent. Kerala, Punjab and West Bengal are at the bottom with growth rates from -0.3 percent to 2.3 percent. West Bengal, Kerala and the Punjab did much worse, with West Bengal and Punjab slowing down by close to 2.5 percent. *Clearly Punjab and West Bengal are no longer agricultural growth leaders.*Compared to the stellar economic growth performance of Kerala at 12.1 percent in the third period, its performance in agriculture was dismal, with a negative growth rate of -0.3 percent. Rajasthan and Tamil Nadu, after losing steam in the first post-reform period, managed to regain their very high agricultural growth in the most recent period, while Uttar Pradesh, and Haryana showed no improvement over the entire period, and Himachal Pradesh improved only modestly. Many poorer states on average are still

performing less well in agriculture than better off states, and some of the initially richest states doing poorly in agriculture.

The sharpest improvements in growth performance in the third period has shifted to the middle income states, led by the exceptional performance of Karnataka at 6.1 percent and Gujarat at 5.8 percent. Consistent with this, in the second reform periods the quadratic regressions showed a peak in the middle income states (which had already emerged in the first reform period). The answer to the first question for agriculture therefore is that the positive association between initial per capita income and growth has changed to a more complex one with a peak at the middle income levels.

5. Structural transformation at the state level

In Table 2 we explore the nature and pace of the structural transformation in the state between 1983 and 2010, again using data from NSSO surveys. In the last two columns we computed the gap between the share of the workforce in agriculture and the share of GSDP in agriculture.

In 2000, richer states tended to have a lower share of GSDP in agriculture than poorer states, except for Haryana and Punjab, which still were dominated by their agriculture. Very high shares of agriculture in the labor force were recorded not only in the very poor states of Bihar, Uttar Pradesh, Orissa, Rajasthan, and Madhya Pradesh, but also in the middle income states of Himachal Pradesh and Andhra Pradesh. As discussed in section 2, the gap between these shares has been rising over time at the all India level, and therefore also in most Indian states.

Table 2: Share of agriculture in GSDP(at 2004/05 prices) and employment in Indian states

States	Share of agriculture in SGDP (%)*		Share of agriculture in total workforce (%)**		GAP	
	1981/82 to 1992/93	1993/94 to 2009/10	1981/82 to 1992/93	1993/94 to 2009/10	1981/82 to 1992/93	1993/94 to 2009/10
Bihar	35	24	77	69	42	45
Uttar Pradesh	41	30	72	61	31	31
Rajasthan	40	27	70	60	30	33
West Bengal	33	26	56	46	23	20
Madhya Pradesh	42	28	76	69	33	41
Orissa	47	27	70	65	23	39
Karnataka	40	25	67	58	27	33
Tamil Nadu	23	14	54	44	31	30
Andhra Pradesh	38	27	65	58	27	31
Kerala	31	19	56	38	25	19
Gujarat	29	17	60	53	32	35
Maharashtra	16	12	60	51	44	39
Himachal Pradesh	45	27	80	66	35	40
Haryana	37	26	68	50	31	24
Punjab	43	34	64	49	22	15
India(15 states)	36	24	66	56	30	32

Source: CSO and NSSO rounds of Employment and Unemployment Surveys,
*the agricultural share in total SGDP is based on 2004/05 prices, ** the total workforce in agriculture is defined by the usual status of workers

The answer to our second question is that convergence of the output and labor shares of agriculture in the economy have started in Kerala, Punjab, Haryana and Maharashtra. In Punjab and Haryana it may be thanks to the rapid agricultural productivity growth over the past five decades. Punjab is also the only state in which the manufacturing share has increased. In Kerala the sector shift has been from agriculture to services. A tight labor market may be pulling workers out of agriculture and leading to the sharp decline of the labor share in agriculture. A similar factor may be operating in Maharashtra too. Convergence has also started in West Bengal, Tamil Nadu, but the gaps between the output share and the labor share of agriculture have narrowed only slightly. *We therefore see that the structural convergence of the economy has started in 6 out of 15 states.*

6. The composition of the Economy

In table 3 we look at the changing the composition of the economy during the post reform period across a subsample of 8 states which span a wide range of per capita income growth. Unlike in previous analysis, they are now ordered by their growth rates in the most recent sub-period. Already in 1995 the states had widely different composition of the economy.[8]The sectoral composition in all states followed a number of common trends. In all states we see a sharp decline in the share of agriculture, with the absolute percentage decline in Bihar from 39% to 20% being the largest, and the decline in Maharashtra from 17% to 11%the smallest. Despite higher income elasticities for manufactured goods, their share has been constant or declined in all states except for the Punjab.[9] The share of other industries has either stayed constant or increased. The final common trend is the sharp rise in the services sector, which rose to over 60% in all but Gujarat, Punjab, and Madhya Pradesh. The largest increase was in Tamil Nadu, from 48 percent to 64 percent, while the smallest one was in Madhya Pradesh, from 45-51 percent.*In answer to question 3 we therefore conclude that the sector compositions in virtually all states have evolved in line with the changes in sectoral composition at the all India level, although with significant variations around the common trends.*

[8]Agriculture's share was the highest in the Punjab, the initial home of the Green Revolution, and the lowest in Maharashtra, a highly diversified state. The manufacturing share was only at 6 percent in the poorest of all states, Bihar, but was at 30 percent in Gujarat. Services already were slightly above or below 50 percent in Bihar, Kerala, Maharashtra, Tamil Nadu and West Bengal, with both some of the poorest and some of the richest states having already very high services shares. Historical and endowment factors appear to have played a big role in determining sector composition at the state level.

[9]It is disappointing that only the Punjab managed to have an increase of its manufacturing share of just 1 percent. Gujarat managed to hold its share at the very high level of 30 percent, as did West Bengal at its low share of 10 percent. The remaining states saw a decline in the manufacturing share. The share of other industries increased in 5 of the 8 states, stayed constant in Tamil Nadu and West Bengal, and declined by just one percent in Maharashtra.

Table 3: Evolution of sectorGDP shares across States

State	Agriculture		Manufacturing		Other industries*		Services	
	1995	**2010**	**1995**	**2010**	**1995**	**2010**	**1995**	**2010**
Gujarat	22	13	30	30	10	12	38	45
Bihar	39	20	6	4	4	16	51	60
Kerala	27	10	11	7	12	19	50	64
Maharashtra	17	11	22	16	10	9	51	64
Tamil Nadu	19	9	24	18	9	9	48	64
West Bengal	33	20	10	10	8	8	49	62
Punjab	41	28	15	16	8	11	36	45
Madhya Pradesh	31	22	13	10	11	17	45	51

* Other industries includes Mining and Quarrying, Electricity, Gas and Water Supply and Construction.
Source: CSO

7. The Diversification of Agriculture

As shown by Birthal et al, diversification of agriculture away from food grains and cereals to other agricultural commodities has happened in all regions, but with very different patterns of diversification across states. In table 4, we compare the agricultural production patterns (shares in total value of output) across eight states, and between 1991-1992 and 2007-09.

Similarity and differences of changes among the states

Among the 8 statesanalyzed, in 2008 Bihar, Punjab and West Bengal have specialized production structures with two commodities making up more than 60 % of agricultural output. Bihar specializes in livestock and cereals. Punjab specializes in cereals and livestock with the two commodities accounting for more than three quarters of its agriculture, suggesting a strong comparative advantage in these products. West Bengal specializes in horticulture and cereals. In the five less specialized states cereal shares range from a low of 2.8 % in Kerala to 16 % in Madhya Pradesh. Livestock shares vary from 20 % in Maharashtra to 25 % in Kerala, while the share of horticulture varies from 6 % in Punjab to 37 % in West Bengal. Each of the less specialized states also produces a wide variety of other agricultural commodities.

How and why did the states evolve to these patterns of production? *All 8 states in our analysis saw a sharp reduction in their share of cereals.* Bihar, Gujarat, Madhya Pradesh, Maharashtra, Kerala and Tamil Nadu cut their cereals share to less than half, and in some cases to less than a third of the former value. The Punjab and West Bengal cut it by about 1/3rd. *All states sharply increased their production of fruits and vegetables,* with Maharashtra increasing it from almost zero to 23 percent, and Bihar increasing it from 1.5 percent to 22.7 percent, both astounding transformations. Slightly lower increases were observed in West Bengal and Tamil Nadu, while the increase in the Punjab was the lowest, followed by Gujarat. *Since among foods the cereals tend to have low income elasticities while those of fruits and vegetables are higher, these two common trends show strong impact of income growth on state level composition of output.*

Table 4: Changes in Agricultural production patterns across eight Indian States, 1990/92 to 2007/09

States	Bihar		M.P		Maharashtra		West Bengal	
Year	1990/92	2007-09	1990/92	2007-09	1990/92	2007-09	1990/92	2007-09
cereals	55.3	25.9	42.3	16.4	29.6	10.9	42	23.4
pulses	10.3	2.2	21.7	10	8.3	4.8	1.3	0.5
oilseeds	1.8	0.7	20.6	22.3	8.2	7.9	3.4	2.4
sugar	6.8	1.3	0.8	0.6	13.1	9.6	0.5	0.4
fibres	1.9	0.7	2.2	2.2	7.5	8.9	4.2	2.4
Fruits & vegetable	1.5	22.7	0.2	9	0.3	23	8.9	36.7
all other crops	0.4	6.5	3.3	12.4	1.7	14.7	2	8.9
livestock	22	40	8.9	27.1	31.2	20.2	37.8	25.4
Total	100	100	100	100	100	100	100	100
States	Punjab		Kerala		Tamil Nadu		Gujarat	
Year	1990/92	2007-09	1990/92	2007-09	1990/92	2007-09	1990/92	2007-09
cereals	76.4	45.4	10	2.8	49.8	13.7	22.8	10.3
pulses	0.9	0.1	0.2	0	3.8	0.8	7.6	2.2
oilseeds	1.5	0.4	18.6	18.3	20.9	10.6	24.7	16.4
sugar	4.1	1.4	0.5	0.1	14.7	10	10.6	4.2
fibres	11.2	4.9	0.1	0	3.8	0.4	11.2	15.2
fruits & vegetable	0	6.1	3.8	18	3.3	24.9	5.5	12.9

all other crops	0.6	9.1	20.5	35.7	2.7	7.8	5	12.1
livestock	5.3	32.5	46.3	25	1.2	31.7	12.6	26.7
Total	100	100	100	100	100	100	100	100

*all other crops include drugs and narcotics, spices and condiments, other crops, by products, kitchen garden
Source: CSO

Similarly, all other crops grew everywhere, most sharply in Kerala, where it increased by 15 percent, Maharashtra, Madhya Pradesh, Gujarat, Punjab and West Bengal (by about 7 percent), They grew to a lesser extent in Bihar by 6 percent and Tamil Nadu by 5 percent.

In all states where there was pulse production in 1990 to 1992 it declined significantly, including in the states where it had been an important component of the production pattern: Madhya Pradesh, Bihar, Maharashtra, Gujarat, and Tamil Nadu.The share of oilseeds declined in all states except in MP.The expansion of the oilseed share in MP may be associated with the growth of soybean production. The oilseed share declined most in Tamil Nadu. *Since pulses and oils also have high income elasticity, their decline is most likely driven by declining comparative advantage of India in their production.*

Tamil Nadu increased its livestock share sharply from just 1.2 percent to almost a third.The livestock share in the Punjab also rose sharply, from about 5.3 percentto nearly one third, but. Gujarat and Madhya Pradesh also increased their diversification into livestock, while Maharashtra, West Bengal and especially Kerala diversified out of it. Fibres were initially significant shares in Punjab (11.2%), Gujarat (11.2%) and Maharashtra (7.5 percent). They grew in Gujarat and Maharashtra and declined sharply in Punjab. They also declined sharply in the lessimportant producing states of West Bengal and Tamil Nadu. *Unlike for cereals vegetables and other crops, we see little association between diversification into livestock and fibres on the one hand and growth in per capita income on the other. Opportunities in interstate trade have allowed states to respond more closely to their trade opportunities and comparative advantage than in cereals and fruits and vegetables.*

8. How to accelerate growth: The case of Gujarat

It is not only the nonagricultural sectors that drive the structural transformation, but also rapid growth of agriculture and agricultural productivity. Can states with lower agricultural growth learn from high growing states? We analyze the growth of Gujarat to get some clues to this question. The agricultural performance of the semi-arid state of Gujarat in the last decade has been remarkable, especially given that it is a semi-arid to arid state with no outstanding agro-climatic endowment. The summary of the analysis of Tushar et al.(2009) is therefore summarized here: In the 1970s,agriculturehad been considered a drag on the economy and showed high volatility. Since 1999-2000 however, agricultural growth has been at a rate of close to 10 percent and its fluctuations have become less severe. Shah et al. 2009 attribute the rapid growth to the following factors: **Rainfall** was good in most years, except in 2002 in the southern and central parts that are covered by canal. **Minimum support prices** for wheat, cotton and other crops were highly remunerative. During recent years Gujarat has emerged as **India's largest cotton producing state** and largest supplier of cotton to China, spurred by the wildfire growth of initially "illegal" production of bio-technology (Bt) cotton. Since the early years the price of Bt cotton seeds have dropped by more than half, which has further helped the expansion of cotton production. *Some of these factors were also available in other states and cannot explain the exceptional growth experience of Gujarat.*

We therefore have to look at policies and programs to find reasons for superior performance of Gujarat agriculture compared to other states. These include various **measures of the government to enhance access to markets**: It was among the first states to amend the Agricultural Produce Marketing Committee (APMC) Act which enabled farmers to directly sell their produce to wholesalers, exporters, industries and large trading companies without having to operate through commission agents. It also allowed large players to establish spot exchanges. The amendment also helped create conditions conducive for the spread of

contract farming. The government encouraged large corporate to establish retail chains and source their requirements directly from farmers. Gujarat government has also pursued aggressive policies to promote diversification to high value crops, especially fruit and vegetables, and spices and condiments. Gujarat also has **superior road infrastructure**: Today Gujarat has km of roads per 100 sq km and a road density of 1.35 km per sq km. Some 98.7% of Gujarat villages have road connectivity, and 77% of rural roads are surfaced.[10] The superior road conditions may be associated with the extensive effort to market milk from every village.

Gujarat conducts **annual month-long *Krishi Mahotsav* campaign as a unique extension model** that brought agricultural scientists, extension staff, agro-industries, input suppliers, cooperatives, banks, local and state-level political leaders together on a platform to exchange knowledge and information on the latest technologies and market opportunities. Large agricultural exhibitions the agricultural university campuses and district towns are widely attended by farmers. A *Krishi Rath*complete with audio-visual equipment, posters, models and accompanied by scientists and administrators, visits every village of the state. Scientists undertake soil health tests and give soil-health cards to the farmers detailing the soil composition, and the best possible crops for the soil type. They also carry out vaccination of the cattle and distribute kits on agriculture, animal husbandry, and horticulture to the five poorest farmers in the village.

The **farm credit system too has been revitalized**. Agricultural loan disbursements in Gujarat have clocked 22-25% annual growth rate, thanks to supportive government policies. In the three years ending 2006-07, for example, agricultural loan disbursals in Gujarat doubled from 4,735 crores in 2003-04 to 10,468 crores in 2006-07.

[10]The national average of the road density is 43 km per 100 sq km. 46.45 percent of rural roads are surfaced on an average for India (morth.nic.in).

D**evelopment of the Sardar Sarowar Projet (SSP) has not been a significant contributor to the agricultural growth of the state**: The SSP dam stores enough water in the dam to irrigate 1.8 million hectares as originally planned. However, only about 80,000 to 100,000 are actually irrigated. While the main and branch canals are nearly complete, the government is facing major road blocks in acquiring land for creating the network of distributaries, minors and sub-minors. "While Gujarat has surpassed other states in many fields of agricultural policy, management of large irrigation projects remains an area with much scope for improvement and innovation."

On the other hand, other innovations in groundwater management have been highly successful: The **rainwater harvesting and groundwater recharge program** has created half a million small scale structures by 2008, all in a campaign mode all under the oversight of the state's Water Resource Department. The Gujarat Green Revolution Company (GGRC) developed a **subsidy-loan scheme for micro irrigation** which is by far the best offered by any state. As a result, the spread of micro-irrigation technologies is more rapid in Gujarat than other states during recent years. Most importantly, since 2003-06, Gujarat implemented **Jyotirgram Yojana**, with the aim of providing 24/7 power supply to villages. The government invested Rs 1,200 crores in separating agricultural feeders from non-agricultural feeders throughout Gujarat. It provides farmers a rationed power supply at 430-440 voltage on a strict schedule with very few interruptions. At the same time this power supply does not interfere with the 24/7 power supply to the villages.

The question for borrowing of lessons on promotion of agricultural growth is whether these policy and program initiatives were possible because of unique material and cultural conditions of Gujarat that do not obtain in other states. It is hard to see, however, how this could be the case across all of the policies and programs.

9. Conclusions

The sharply accelerating growth of India has had a positive impact on all states, all of which recently had significantly higher economic growth rates than in the last two decades of the 20th century. The situation is different in agriculture, where growth slowed down between the 1980s and the 1990s, and did not yet exceed 4 percent in the past decade. Until the early 1990s, the more advanced states had higher economy-wide growth and agricultural growth, but these associations have disappeared since 1992, suggesting a sharpchange in economy-wider and agricultural growth opportunities.

Significant convergences of the output and labor shares of agriculture in the overall economy have occurred in Kerala, Punjab, Haryana and Maharashtra. Convergence has also started in West Bengal Tamil Nadu, but the gaps between the output share and the labor share of agriculture have narrowed only slightly. We therefore see that the structural convergence of the economy has started in 6 out of 15 states, suggesting that faster growth may bring structural transformation closer than what the national picture suggests.

The economy shows common trends in the differing structural transformation across the states, but with significant variations across the states: The share of agriculture in the economy remains the highest in the Punjab, followed by West Bengal and Madhya Pradesh, while it is the lowest in Tamil Nadu, Kerala, Maharashtra and Gujarat that vary slightly around 10 percent. We find states with good and poor agricultural endowments in both groups, suggesting that the change in the share of agriculture is heavily influence by the changes in the other sectors of the economy. The share of services increased in all the states, but at widely different rates. The share of manufacturing was mostly on a downward trend, except in Punjab.

In agriculture, all states reduced their cereals share and increased their share of horticulture.

The widely differing initial agricultural production patterns, and their diverging trends over time, cannot be related to their initial per capita incomes or to its growth. While at the national level the drop in the share of cereals and the rise in the livestock share are a reflection of per capita income growth, how these trends play out in the states is influenced by changing opportunities for interstate trade, changing comparative advantage, and state level policies and programs.

It is likely that states that grow slowly can learn from fast growing states such as Gujarat. However, the question is whether such impressive agricultural performancesare due to the state-specific agricultural policies and institutional changes or to specific economic opportunities and cultural conditions. Are they associated with a particular political regime? Are they the result of campaigns that could falter with a change in government? Or have institutions changed sustainably? These issues will determine whether the policy and institutional changes replicable in other states, a rich agenda for further research.

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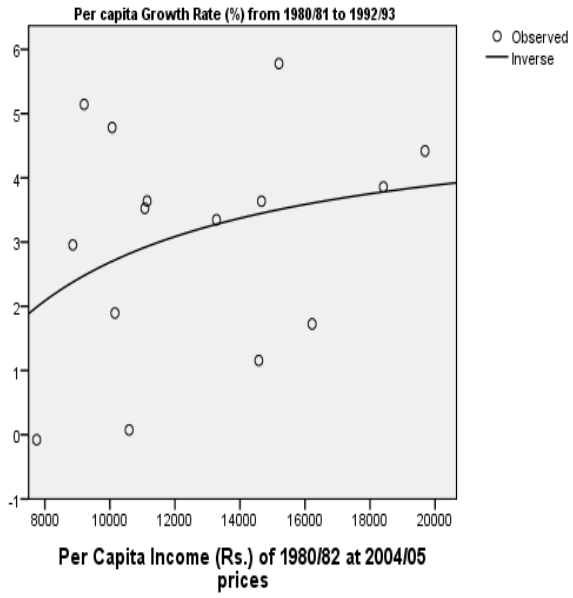
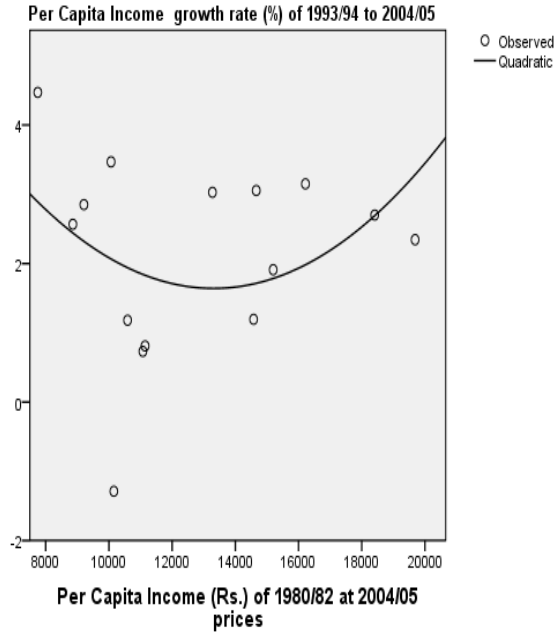
Annex 1: Regressions of per capita and agricultural income growth in three decades on average per capita income between 1980 and 1982

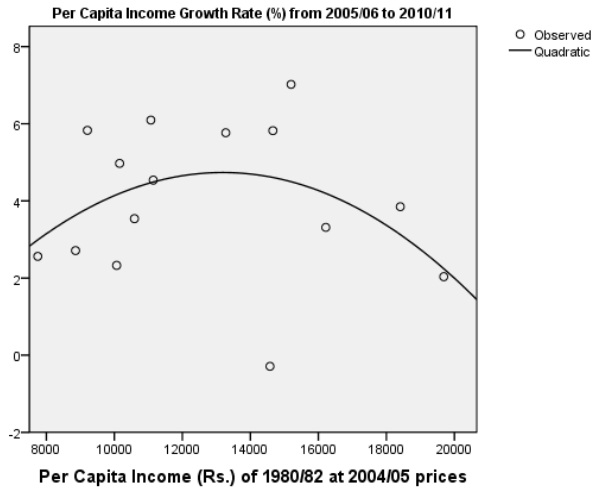
Notes: For each time period the functional forms chosen so as to maximize R-square
prcap = Per capita Income of 1980/82 at 2004-05 prices
aggw(i) = agriculture growth rate for the ith period
prcapgw(i) = per capita income growth rate for the ith period
ith period = 1 for 1980/81 to 1992/93 (pre reform period)
2 for 1993/94 to 2004/05 (first post reform period)
3 for 2005/06 to 2010/11 (second post reform period)
t values in brackets.
* significant at 5 percent level, ** significant at 10 percent level

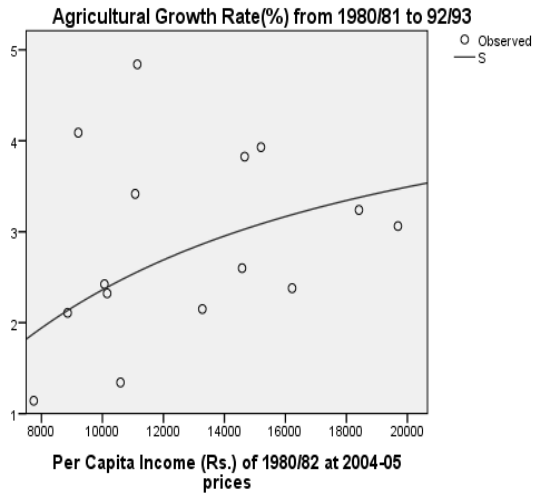




prcapgw (1) = 5.085 – 24004.66 (1/prcap) prcapgw(2) = 8.794 – 0.001prcap + $(4.037E\text{-}8)^2$
(2.889)* (-1.192) (1.529) ** (-1.209) ** (1.243) **

Rsq = 0.098 Rsq = 0.117



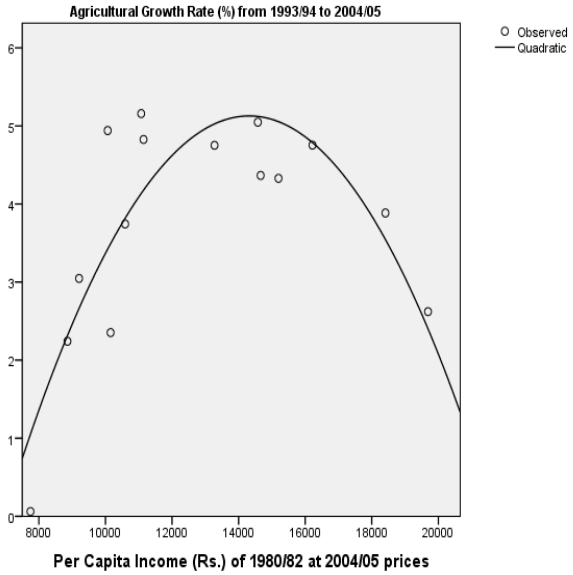


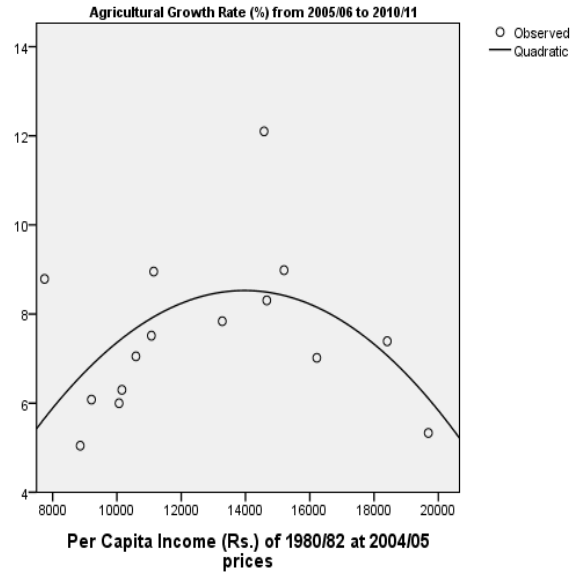
prcapgw (3) = -5.529 + 0.002prcap – $(5.902E\text{-}8)^2$
(-0.702) (1.280) (-1.328)

Rsq = 0.135

aggw(1) = exp[1.642 – 7828.75 (1/prcap)]
(4.347)* (-1.811)*

Rsq = 0.202





aggw(2) = -14.229 + 0.003prcap–9.444E-$8(prcap)^2$
(-4.498)* (-5.288)* (5.532)*

Rsq = 0.736

aggw(3) = -5.928+0.002prcap–7.407E-$8(prcap)^2$
(-0.891) (2.013)* (-1.972)*

R sq = 0.255

Annex table 2: State level Growth Rates of Agriculture in the three sub-periods

Agr. growth rate	1981/82 to 92/93	1993/94 to 04/05	2005/06 to 10/11
Bihar	-0.1	4.5	2.6
Uttar Pradesh	3.0	2.6	2.7
Rajasthan	5.1	2.9	5.8
West Bengal	4.8	3.5	2.3
Madhya Pradesh	1.9	-1.3	5.0
Orissa	0.1	1.2	3.5
Karnataka	3.5	0.7	6.1
Tamil Nadu	3.6	0.8	4.5
India(15 states)	3.2	2.2	4.3
Andhra Pradesh	3.3	3.0	5.8
Kerala	1.2	1.2	-0.3
Gujarat	3.6	3.1	5.8
Maharashtra	5.8	1.9	7.0
Himachal Pradesh	1.7	3.2	3.3
Haryana	3.9	2.7	3.8
Punjab	4.4	2.3	2.0

Source: CSO and authors calculation