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Structural Change and Agricultural Performance at the State Level in India: 1980-2010

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Abstract

Given the structural transformation at national level to be stunted one, the paper has compared this process with related issues at a state level in India. The study has found that the economic reforms have led not only to a sharp rise in the growth rates across all states, but also to the disappearance of the relationship between initial income and growth. The growth of agriculture in India appears almost to be decoupled from the rapid economic growth. The study has concluded that the structural convergence of the economy has started in 6 out of 15 states, suggesting that a faster growth may bring structural transformation closer than what the national picture has suggested. There are strong common trends in the sectoral composition of the economy across the states, but with wide variations around them. For the sectoral composition of agriculture, on the other hand, there are both common and divergent trends. In agriculture, changes in comparative advantage and trade opportunities are the additional important drivers of change in the sector composition of output.

Key words: Structural transformation, labour productivity, agricultural diversification

JEL Classification: O13, Q18, J21, J24

Introduction

In spite of rapid economic growth during the past three decades (1980 – 2010), structural change in the Indian economy has been slow and atypical. While economic growth has accelerated sharply, agricultural growth has badly lagged behind. As a share of GDP, agriculture has declined sharply, manufacturing has remained at a low and fairly stable, while services sector has increased sharply, followed by industry other than manufacturing. As a consequence, labour has moved from agriculture to the non-agricultural sectors, but rather than finding good jobs in the urban economy,

the agricultural workers have moved to informal sector or opted for self-employment in the vibrant rural non-farm sector, producing what is called a stunted structural transformation (Binswanger, 2013; 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 late-1960s, the shares of pulses and oilseeds, and of other crops have declined steadily. Until 1996, the share of cereals was the highest at 35 per cent but has declined rapidly since then as a consequence of the accelerating income growth. In this paper, we have first summarized what we have learnt about structural transformation at the national level and then proceeded to address the following researchable issues at the state level:

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- (1) Has there been convergence between initially low-income and high-income states in the economy-wide and agricultural growth rates?
- (2) Have some states been able to reach the turning point in structural transformation where the ratio of the share of agriculture in total output and its share in the labour force starts to converge?
- (3) How do states vary in the evolution of the sector composition of the economy?
- (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?

Stunted Structural Transformation of Indian Economy: A Review

A literature review of structural change at the national level has shown that 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 agricultural sector in GDP has declined sharply, and the remaining industrial sectors and services sector have shown growing GDP shares. The absorption of labour in the urban economy has been slow, and has mainly been in the informal employment where there are no job security and benefits. The rural-urban migration has been far less than could have been expected in a rapidly-growing economy.

The rural population and the labour force are continuing to rise rapidly, on account of population growth and of the slow rural-urban migration. The literature on structural transformation has shown that in the developed countries, the share of GDP in agriculture declines during the transformation, while the share of manufacturing and other industries rises, the share of agricultural labour in the total labour force initially stays high or declines slowly, but declines more sharply in the later phases of development of the economy. Therefore, the difference between the share of agriculture in the economy and its share in the labour 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 labour force is therefore a commonly used indicator of structural transformation (Timmer, 2009). During the initial phase of structural transformation, productivity differentials between labour productivity in urban and rural areas exist, but then widens sharply, again until the turning point is reached, and thereafter, the rural labour productivity starts to catch up. As a result of the widening of the urban and rural productivity differentials, farm incomes fall behind incomes earned in the rest of the economy (Binswanger, 2013). As a consequence of the productivity differential, throughout the structural transformation, labour migrates from agriculture for better job opportunities. As long as there is abundant labour in the rural areas, this migration does not raise economy-wide and rural wages. But, when the Lewis turning point is reached, these wage rates start to rise.

From 1970s onwards, the differences between output share and labour share of agriculture have widened significantly in India, suggesting that the Indian economy is still in an early stage of the structural transformation, with too little labour able to leave agriculture. While since early-1990s, the economic growth has accelerated significantly, the agricultural growth rate has been lagging behind. As a consequence of high non-agricultural growth, low agricultural growth, and continued growth of the agricultural labour force, the ratio of labour productivity between the non-agricultural sector and the agricultural sector has widened at an accelerating rate of 4.2. The two indicators show that India is not close to reaching the turning point in its structural transformation.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 Tendulkar methodology (Planning Commission, 2009)] declined from 50.1 per cent in 1993-94 to 31.8 per cent in 2004-05, or by 18.3 percentage point, while the urban poverty declined from 41.8 per cent to 25.7 per cent, or by 6.1 percentage point.² In absolute terms,

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 Ahluwalia (2011) suggest that the national poverty rate under the new Tendulkar committee poverty line has declined further from 37.2 per cent in 2004-05 to 29.8 per cent in 2009-10, or at an accelerated rate of about 4.31 per cent per year. The rural poverty rates fell from 42 per cent to 33.8 per cent and the urban poverty rates fell from 25.5 per cent to 20.9 per cent, respectively for 2004-05 and 2009-10.

Table 1. Level and growth in per-capita income in Indian states (at 2004-05 prices)

State	Per-capita GSDP (₹)				Annual compound growth rate in per capita GSDP (%)		
	Average of 1980-81 and 1982-83	1980-81 to 1992-93	1993-94 to 2004-05	2005-06 to 2010-11	1981-82 to 1992-93	1993-94 to 2004-05	2005-06 to 2010-11
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
Odisha	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 states)	11376	13186	20526	32449	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
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.

Note: The figures within the parentheses are ranks of the states

the decline has been larger in the rural areas than in urban areas, but in relative terms, the opposite is the case. The urban-rural income ratio has declined slightly, while the urban-rural consumption ratio has increased modestly.³ Thus, these data series do not suggest a sharp increase in the urban-rural disparities over the past three decades.

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 have been only a few jobs in the urban economy. Implying a stunted structural transformation of the Indian economy whereby labour moved from agriculture to rural non-farm sector, rather than to more secure jobs with pensions and other security benefits (Binswanger, 2013).

The reason behind this is the failure of the urban economy to create enough jobs, especially in labour-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 the continued urban growth spillovers and a significant acceleration of agricultural growth.

Economic Growth and Inequality at State Level

In Table 1, the level and growth in per-capita income of Indian states for the period 1980-81 to 2010-11 have been displayed. Table 1 shows the initial per-capita incomes across states during the pre-reform periods between 1980-81 and 1982-83, and then for the period 1980-81 to 1992-93 and during the two post-

³ The ratio of urban to rural per capita income has declined from 2.45 to 2.30 between 1970s and 2010. 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 by 2010. Whether rural-urban income and consumption disparities have increased is therefore dependent on the data used.

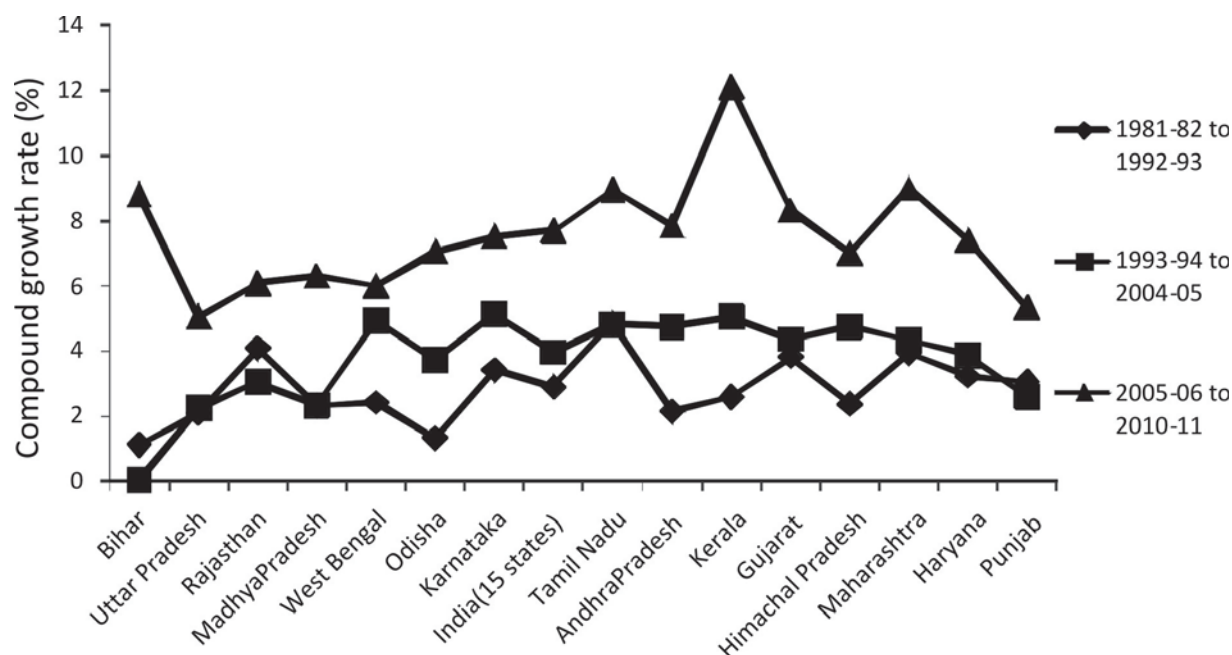


Figure 1. Annual compound growth rate of per-capita GSDP

Source: Authors' calculations based on CSO data (various years)

Note: The states are arranged as per-capita income in 1980-82 (at 2004-05 prices)

reform periods, viz. 1993-94 to 2004-05 and 2005-06 to 2010-11. Also shown are the annual compound growth rates in per capita GSDP for each of these three periods.⁴ Here we extended the analysis of Birthal *et al.* (2011) from 1980-81 to 2004-05 to additional years from 2004-05 to 2010-11, now available in the CSO data. The states have been ordered from the lowest to the highest per-capita income based on their average income in the base period, viz. TE 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 during the 1993-94 to 2004-05 period. Bihar remained the poorest state, and none of the six poorest states could manage 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 the number one position.

In Figure 1 we have plotted the growth rates (%) of per capita GSDP across selected 15 states of India. During the pre-reform period (1981-1992), India's per capita growth rate was 2.9 per cent, it accelerated to

4.0 per cent in the second period (1993-2004) and to 7.6 per cent during the past 5-year period of 2005-2010. During the pre-reform period 1981-1992, the per capita growth rates of Rajasthan, Tamil Nadu, Gujarat and Maharashtra were above or near 4 per cent per annum. Karnataka, Punjab and Haryana followed the lead group at around 3.5 per cent. Bihar and Odisha had growth rates well under 2 per cent, and all other states had growth rates between 2 per cent and 3 per cent. Therefore, in the 1980s, there was 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 periods was that per-capita income growth accelerated in the middle- and most high-income states, from West Bengal to Haryana but not Punjab. Since 2005-06, all 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 of 12.1 per cent, 9.0 per cent, 8.8 per cent and 8.8 per cent, respectively, while Uttar Pradesh and Punjab are showing the lowest at around 5 per cent and Rajasthan,

⁴Three-year averages of per-capita income were used to smoothen the fluctuations in the annual data.

Madhya Pradesh and West Bengal are at around 6 per cent. 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.

Birthal *et al.* (2011) have shown that there was absolute divergence of incomes across the states between TE 1980-82 and TE 2003-04. After controlling for the structural characteristics of states, they have found a tendency of convergence among states in the post-reform period. Investment in physical infrastructure and human capital have enhanced the economic growth, combined with improving labour market linkages, and labour-intensive agricultural technologies might be the factors influencing.

We then ran regressions of GSDP growth in each of the three periods on the initial per capita income in TE 1980-82.⁵ We confirm the findings of Birthal *et al.* (2011) that in the pre-reform period up 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 R-square value of only 0.1. However, in the post-reform periods, this association disappeared in the regressions without any other factor included. The figures given in Annexure I suggest that in the first post-reform period (1993-94 to 2004-05), the lowest and highest-income states grew a bit faster than the middle-income states, while in the second post-reform period (2005-06 to 2010-11), it was the middle-income states that had the fastest economic growth rate. The answer to our first issue about the convergence of economic growth rates therefore is that the economic reforms have led not only 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 has implied a significant convergence in the economic growth rates across states in the second reform period of 2004-05 to 2010-11.

Ahluwalia (2011) has looked 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 was the period of rising interstate inequality, but this tendency has not persisted since then.

Agricultural Growth

In Figure 2 we have plotted the growth rates of agricultural GSDP (gross state domestic product) in the same initial per-capita income order as in Figure 1. Figure 2 illustrates the slowdown in agricultural growth of India (as measured by the simple average of state growth rates), during pre-reform to first post-reform period, from 3.2 per cent to 2.2 per cent, and the sharp recovery to over 4.3 per cent since 2005-06.⁶

During the pre-reform period, Maharashtra had the highest agricultural growth rate of 5.8 per cent. Rajasthan, West Bengal and Punjab followed with growth rates between 4.4 and 5.1 per cent. The poor states of Bihar and Odisha had growth rates near zero, while Kerala managed an agricultural growth rate of 1.2 per cent. The other states had rates in between. In the regression analysis of the pre-reform base period, we have found a positive relationship between initial per-capita income levels and growth.

In the second post-reform period (2005-06 to 2010-11), the best performers were Maharashtra, Karnataka, Gujarat, Rajasthan and Andhra Pradesh with agricultural growth rates between 5.8 per cent and 7.0 per cent. Kerala, Punjab and West Bengal came to the bottom with growth rates from -0.3 per cent to 2.3 per cent. West Bengal, Kerala and the Punjab did much worse, with West Bengal and Punjab slowing down by close to 2.5 per cent. Clearly Punjab and West Bengal were no longer agricultural growth leaders. Compared to the stellar economic growth performance of Kerala at 12.1 per cent in the third period (2005-06 to 2010-11), its performance in agriculture was dismal, with a negative growth rate of -0.3 per cent. Rajasthan and Tamil Nadu, after losing steam in the first post-reform period, managed to regain their very high agricultural growth during the period 2005-06 to 2010-11, while Uttar Pradesh, and Haryana showed no improvement over the entire period, and Himachal Pradesh improved only modestly. Many economically-weaker states on

⁵ The regressions are available in the Annexure 1.

⁶ National average agricultural value added grew by 3.2 per cent, 2.2 per cent and 4.3 per cent in the three sub-periods, viz. 1981-82 to 1992-93, 1993-94 to 2004-05 and 2005-06 to 2010-11.

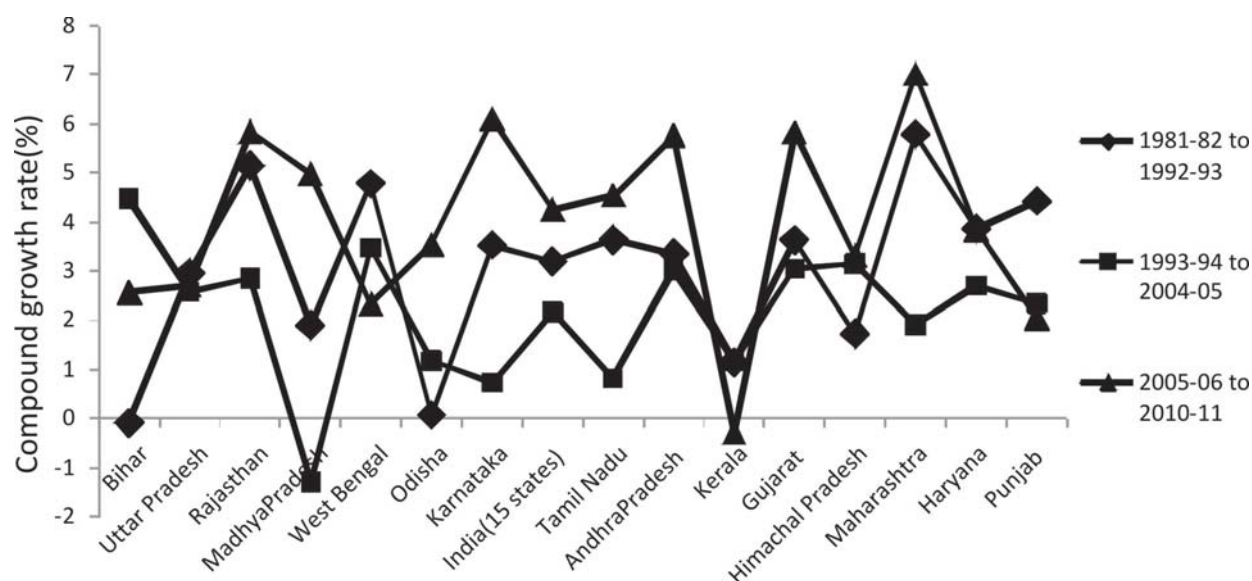


Figure 2. Growth rates (%) of gross state domestic product from agriculture

Source: Authors' calculations based on CSO data (various years)

Note: The states are arranged as per their per-capita income in 1980-82 (at 2004-05 prices)

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

The sharpest improvements in growth performance in the third period (2005-06 to 2010-11) has shifted to the middle-income states, led by the exceptional performance of Karnataka at 6.1 per cent and of Gujarat at 5.8 per cent. Consistent with this, the quadratic regressions have shown a peak in the middle-income states during this period of 1993-2004 (Annexure I) (which had already emerged in the first reform period). The answer to the issue 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 state levels.

Structural Transformation at State Level

Table 2 presents the nature and pace of the structural transformation in the selected states of India between 1983 and 2010, based on the data from NSSO surveys. The last two columns of Table 2 depict the gap between the share of the workforce in agriculture and the share of GSDP in agriculture during pre-reform and post-reform periods.

During 2000s, the richer states have depicted a lower share of GSDP in agriculture than the poorer

states, except for Haryana and Punjab, which still were dominated by their agriculture shares. Very high shares of agriculture in the labour force were recorded not only in the very poor states of Bihar, Uttar Pradesh, Odisha, Rajasthan, and Madhya Pradesh, but also in the middle-income states of Himachal Pradesh and Andhra Pradesh. As discussed earlier, the gap between these shares has been rising over time at the all-India level, and therefore also in most Indian states.

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

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

State	Share of agriculture in GSDP (%)*		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
Odisha	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

Notes: * The agricultural share in total GSDP is based on 2004-05 prices

** The total workforce in agriculture was defined by the usual status of workers

Table 3 depicts the changing composition of the economy during the post-reform period (1995-2010) across a subsample of 8 states which spans a wide range of per-capita income growth. Unlike in the previous analysis, the states in Table 3 have been arranged by their growth rates in the recent sub-period, viz. 2005-2010. Already in 1995, the states had widely different composition of the economy. Agriculture's share was the highest in Punjab, the initial home of the Green Revolution, and the lowest in Maharashtra, a highly diversified state. The manufacturing share was only at 6 per cent in the poorest of all states, Bihar, but was at 30 per cent in Gujarat. Services already were slightly above or below 50 per cent 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 sectoral composition at the state level.

The sectoral composition in all the selected states followed a number of common trends. We can see a sharp decline in the share of agriculture in all the states, with the absolute percentage decline in Bihar from 39 per cent to 20 per cent being the largest, and the decline in Maharashtra from 17 per cent to 11 per cent, the smallest. Despite higher income elasticities for the manufactured goods, their share has been constant or declined in all the selected states, except in Punjab. It is disappointing that only Punjab managed to have an increase of its manufacturing share of just 1 per cent. Gujarat managed to hold its share at very high level of 30 per cent, as did West Bengal at its low share of 10 per cent. 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 per cent in Maharashtra. The share of other industries has either stayed constant or increased.

Table 3. Evolution of sector GDP shares across selected states of India, 1995-2010

State	Agriculture		Manufacturing		Other industries*		Services	
	1995-96	2010-11	1995-96	2010-11	1995-96	2010-11	1995-96	2010-11
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

Note: *Other industries included Mining and Quarrying, Electricity, Gas and Water Supply and Construction.

The final common trend is the sharp rise in the services sector, which rose to over 60 per cent in all states, except Gujarat, Punjab, and Madhya Pradesh. The largest increase was in Tamil Nadu, from 48 per cent to 64 per cent, while the smallest was in Madhya Pradesh, from 45 per cent to 51 per cent. In answer to third issue, we may therefore conclude that the sector compositions have virtually evolved in all the states in line with the changes in sectoral composition at all-India level, although with significant variations around the common trends.

Diversification of Agriculture

As shown by BIRTHAL *et al.* (2011), diversification of agriculture away from foodgrains and cereals to other agricultural commodities has happened in all the regions of India, but with a very different pattern of diversification across states. In Table 4, agricultural production patterns (shares in total value of output) have been presented across 8 states between 1990-1992 and 2007-09.

Similarity and Differences in Changes across States

Among the 8 states analyzed in 2007-09, Bihar, Punjab and West Bengal have specialized production structures with two commodities, making up more than 60 per cent of agricultural output. Punjab has specialized in cereals and livestock with these two commodities accounting for more than three quarters of its agriculture, suggesting its strong comparative advantage in these products. Bihar has specialized in

livestock and cereals. West Bengal has specialized in fruits & vegetables and cereals. In the five less-specialized states, cereals shares range from a low of 2.8 per cent in Kerala to high of 16.0 per cent in Madhya Pradesh. The livestock shares vary from 20 per cent in Maharashtra to 25 per cent in Kerala, while the share of fruits and vegetables varies from 6 per cent in Punjab to 37 per cent 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 the 8 states in our analysis have depicted a sharp reduction in their shares of cereals. Bihar, Gujarat, Madhya Pradesh, Maharashtra, Kerala and Tamil Nadu have cut their cereals share to less than half, and in some cases, to less than a third of the former value. The states of Punjab and West Bengal have cut it by about one-third. All the states have sharply increased their production of fruits and vegetables, with Maharashtra increasing it from almost zero to 23 per cent, and Bihar increasing it from 1.5 per cent to 22.7 per cent, both depicting astounding transformations. Slightly lower increases have been observed in West Bengal and Tamil Nadu, while the increase in the Punjab is the lowest, followed by Gujarat. Among food commodities, cereals tend to have low income elasticities and fruits and vegetables have higher income elasticities. These two common trends show a strong impact of income growth on state-level composition of output.

All other crops group has grown in all states, most sharply in Kerala, where it increased by 15 per cent.

Table 4. Changes in agricultural production patterns across eight Indian states, 1990-92 to 2007-09

(in per cent)

Agricultural products	Bihar		Madhya Pradesh		Maharashtra		West Bengal	
	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	42.0	23.4
Pulses	10.3	2.2	21.7	10.0	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 & vegetables	1.5	22.7	0.2	9.0	0.3	23.0	8.9	36.7
All other crops	0.4	6.5	3.3	12.4	1.7	14.7	2.0	8.9
Livestock	22.0	40.0	8.9	27.1	31.2	20.2	37.8	25.4
	Punjab		Kerala		Tamil Nadu		Gujarat	
	1990-92	2007-09	1990-92	2007-09	1990-92	2007-09	1990-92	2007-09
Cereals	76.4	45.4	10.0	2.8	49.8	13.7	22.8	10.3
Pulses	0.9	0.1	0.2	0.0	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	10.0	10.6	4.2
Fibres	11.2	4.9	0.1	0.0	3.8	0.4	11.2	15.2
Fruits & vegetable	0.0	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	5.0	12.1
Livestock	5.3	32.5	46.3	25	1.2	31.7	12.6	26.7

*All other crops included drugs and narcotics, spices and condiments, other crops by-products, kitchen garden production

Maharashtra, Madhya Pradesh, Gujarat, Punjab and West Bengal have depicted a rise of about 7 per cent each. The group has grown to a lesser extent in Bihar, by 6 per cent and Tamil Nadu, by 5 per cent.

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 has declined in all the selected states, except in Madhya Pradesh. The expansion of the oilseeds share in Madhya Pradesh is associated with the growth of soybean production in the state. The oilseed share has declined most in Tamil Nadu. Since pulses and oils also have high income elasticity, their decline is likely to have been driven by declining competitiveness of pulses and oilseeds against other crops of India, and or against imports.

Tamil Nadu has increased its livestock share sharply, from just 1.2 per cent to 31.7 per cent. The livestock share of Punjab has also risen sharply, from about 5.3 per cent to 32.5 per cent. Gujarat and Madhya

Pradesh have also increased their diversification towards livestock, while Maharashtra, West Bengal and especially Kerala have diversified out of it. The fibres had significant shares initially in Punjab (11.2%), Gujarat (11.2%) and Maharashtra (7.5 %). They grew in Gujarat and Maharashtra, but declined sharply in Punjab and also in the less fibre-producing states of West Bengal and Tamil Nadu. Unlike for cereals, vegetables and other crops, we see a little association between diversification towards livestock and fibres on the one hand and growth in per-capita income on the other hand. The opportunities in interstate trade have allowed the states to respond more closely to their trade opportunities and comparative advantage than in cereals and fruits and vegetables.

Conclusions

In the context of sharply accelerating growth of India over the past two decades, the shares of agriculture in GDP and in labour force have declined. Nevertheless, the gap between the two has still been widening as has the differential in labour productivity

between agriculture and non-agriculture. A structural turning point, where the differential starts to decline, has not been reached. In addition, the structural transformation is atypical in that labour is primarily moving from agriculture to the rural non-farm sector rather than to better jobs in urban areas. This suggests that the structural change of the Indian economy is a stunted one.

All the 15 selected states have accelerated their economic growth rates in the post-reform period (1992 onwards), and 6 of the 15 states have reached the turning point, with significant declines in the gap between the shares in Kerala, Punjab, Haryana and Maharashtra, although the decline is yet very small in Tamil Nadu and West Bengal. There is no longer a significant association between the initial per-capita income in the states and their rate of economic growth.

The growth of agriculture in India appears almost to be decoupled from the rapid economic growth. This growth slowed down between the 1980s and the 1990s, and did not yet exceed 4 per cent in the decade of 2000s. Until the early-1990s, the more advanced states had a higher economy-wide growth and agricultural growth, but the association has disappeared for agriculture, suggesting sharp improvement in economy-wide and agricultural growth opportunities.

The significant convergences of the output and labour shares of agriculture in the overall economy have occurred in Kerala, Punjab, Haryana and Maharashtra. In West Bengal and Tamil Nadu, the gap has narrowed only slightly. The study has therefore concluded that the structural convergence of the economy has started in 6 out of 15 states, suggesting that a faster growth may bring structural transformation closer than what the national picture suggests.

There are strong common trends in the sectoral composition of the economy across the states, but with wide variations around them. The share of agriculture in the economy remains the highest in Punjab, followed by West Bengal and Madhya Pradesh, while it is the lowest in Tamil Nadu, Kerala, Maharashtra and Gujarat. We have found states with good and poor agricultural endowments in both the groups, suggesting that the change in the share of agriculture is heavily influenced by the other sectors of the economy. The share of services sector has increased in all the states, but at different rates. It is disappointing that, except for Punjab, the share of manufacturing was mostly on a

downward trend, even in the states where the turning point has already been reached, suggesting that the economic transformation is also stunted in most of the states.

For the sectoral composition of agriculture, on the other hand, there are both common and divergent trends. All the selected states have reduced their cereals' share and increased their share of fruits and vegetables. Among food commodities, the cereals tend to have low income elasticities and fruits and vegetables have higher income elasticities, these two trends show strong impact of income growth on the composition of output. Except for oilseeds in Madhya Pradesh, in all the selected states the shares of pulses and oilseeds have declined which would be consistent with a decline in competitiveness of these crops relative to competing crops in India or relative to imports.

For livestock production, the study has observed sharply divergent trends. Tamil Nadu, Punjab Gujarat and Madhya Pradesh have all increased their shares of livestock in the agricultural sector, while Maharashtra, West Bengal and especially Kerala have reduced it. The fibres had significant shares initially in Punjab, Gujarat and Maharashtra. They grew in Gujarat and Maharashtra but declined sharply in Punjab and also in the less important fibre-producing states of West Bengal and Tamil Nadu. Unlike for cereals, vegetables and other crops, have depicted little association between diversification towards livestock and fibres on the one hand and growth in per-capita income on the other hand. The opportunities in interstate trade have allowed the states to respond more closely to their trade opportunities and comparative advantage than in cereals and fruits and vegetables.

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Annexure 1

Regressions of per capita and agricultural income growth in 1980-2010 on average per capita income between 1980 and 1982

Notes: For each time period the functional forms were chosen so as to maximize R-square

prcap = Per-capita income of 1980-82 (at 2004-05 prices)

aggw (i) = The agricultural growth rate for the ith period

prcapgw (i) = The per-capita income growth rate for the ith period

ith period = 1 for 1980-81 to 1992-93 (pre-reform period)

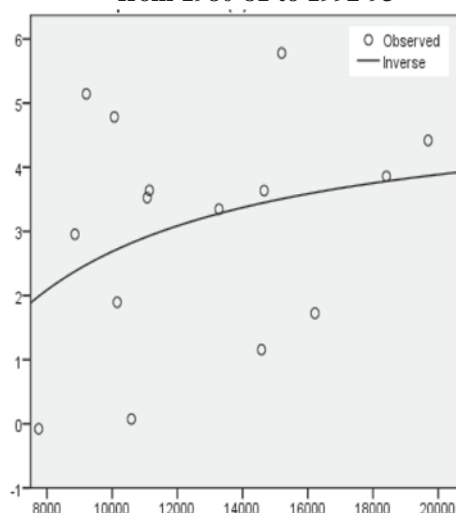
2 for 1993-94 to 2004-05 (first post-reform period)

3 for 2005-06 to 2010-1 (second post-reform period)

t-values in brackets.

* significant at 5 per cent level, ** significant at 10 per cent level

Per-capita income growth rate (%)
from 1980-81 to 1992-93



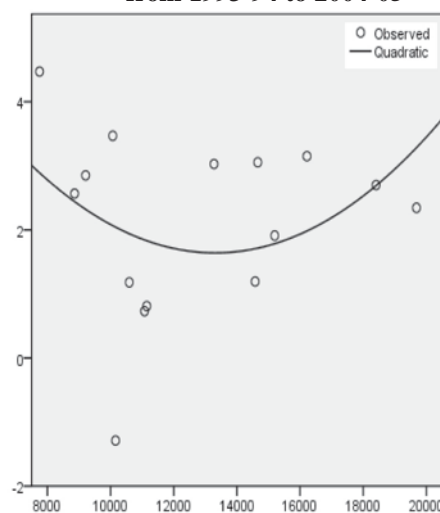
Per-capita income (₹) of 1980-82 (at 2004-05 prices)

$$\text{prcapgw (1)} = 5.085 - 24004.66 (1/\text{prcap})$$

(2.889)* (-1.192)

R square = 0.098

Per-capita income growth rate (%)
from 1993-94 to 2004-05



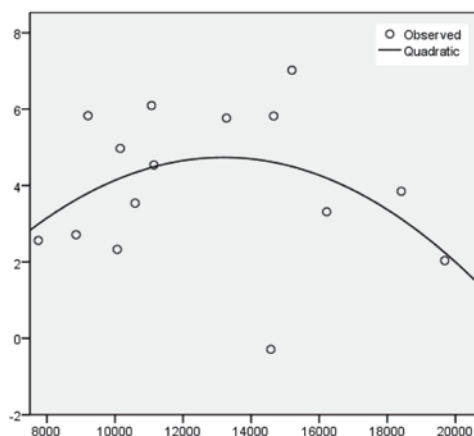
Per-capita income (₹) of 1980-82 (at 2004-05 prices)

$$\text{prcapgw (2)} = 8.794 - 0.001\text{prcap} + (4.037\text{E-}8)^2$$

(1.529) ** (-1.209) ** (1.243) **

R square = 0.117

**Per-capita income growth rate (%)
from 2005-06 to 2010-11**



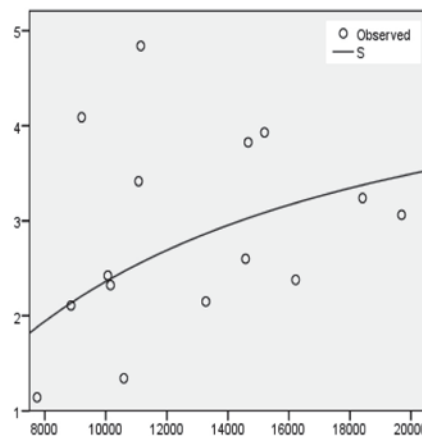
Per-capita income (₹) of 1980-82 (at 2004-05 prices)

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

(-0.702) (1.280) (-1.328)

R square = 0.135

**Agricultural growth rate (%)
from 1980-81 to 1992-93**



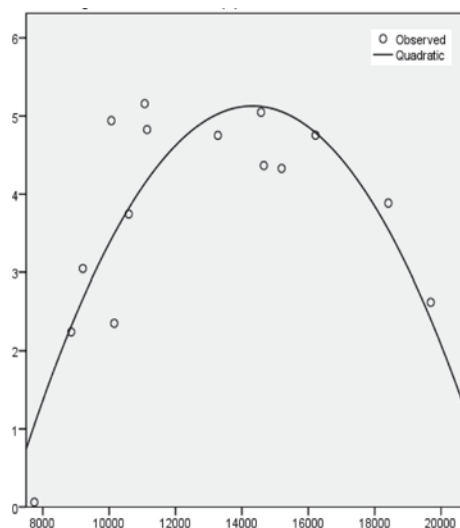
Per-capita income (₹) of 1980-82 (at 2004-05 prices)

$$\text{aggw (1)} = \exp[1.642 - 7828.75 (1/\text{prcap})]$$

(4.347)* (-1.811)*

R square = 0.202

**Agricultural growth rate (%)
from 1993-94 to 2004-05**



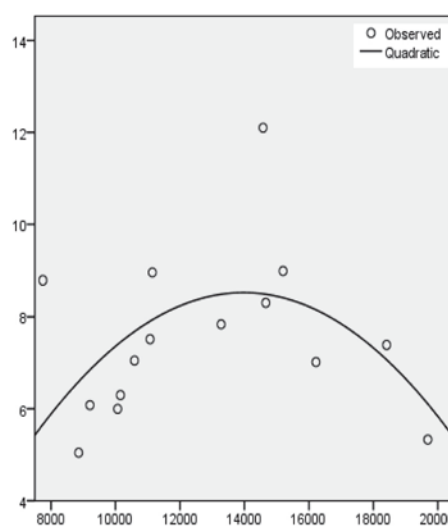
Per-capita income (₹) of 1980-82 (at 2004-05 prices)

$$\text{aggw (2)} = -14.229 + 0.003\text{prcap} - 9.444\text{E-}8 (\text{prcap})^2$$

(-4.498)* (-5.288)* (5.532)*

R square = 0.736

**Agricultural growth rate (%)
from 2005-06 to 2010-11**



Per-capita income (₹) of 1980-82 (at 2004-05 prices)

$$\text{aggw (3)} = -5.928 + 0.002\text{prcap} - 7.407\text{E-}8 (\text{prcap})^2$$

(-0.891) (2.013)* (-1.972)*

R square = 0.255