POLICY BRIEF 32

Agriculture and Regional Disparities in India

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Accelerating economic growth and reducing inter-personal and regional disparities have been the main objectives of India's development policy. The overall growth of the economy reached to 6.3% during 1991/92 - 2007/08, from as low as 3.5-3.7% during 1960s and 1970s. The per capita income also grew from 1.2% during 1960s and 1970s to 3.1% during 1980s and further to 4.4% during 1991/92-2007/08. These trends however are not uniform across states, and there is a growing concern that the accelerating trends are confined to a few rich states, and the poor states have lagged behind[1]. This lack of convergence in growth can be attributed to cross-state differences in the resource endowments, production structure, governance, policies and infrastructure.

Historically, agriculture has been recognized as an engine of economic growth. It enhances economic growth by providing raw material and labour force for industrial activities. A strong linkage of agriculture within agricultural sector and with non-agricultural sector for higher economic growth has been argued and supported by empirical analysis (Johnston and Mellor, 1961). Agriculture generates forward linkages through provision of its outputs as "intermediate inputs" to the industrial sector, and thus contributes to the growth of agro-processing and marketing activities, which in turn creates opportunities for economic growth, import substitution and exports. Agriculture has also strong backward linkages through its demand for industrial products such as fertilizers, pesticides, machines, etc. Further, the rural population provides market for manufactured products and services. Hence, the neglect of agriculture could be detrimental to economic growth and welfare of the people. Timmer (2002) argues that continued neglect of agriculture can lead to political and economic instability, which in turn can reduce level and efficiency of investment.

In this brief note, we look at (i) whether regional disparities in India have increased or decreased, and (ii) how can agriculture contribute towards bridging the gap between rich and poor states. From the perspective of livelihood of rural people, agriculture continues to be an important economic sector, despite a rapid fall in its share in national income; from 45% in early 1970s to about 18% now. The sector engages 58% of the total workforce. Hence, we hypothesize that continued high employment pressure on agriculture is one of the main causes of inter-state differences in income levels and economic growth.

Trend in Regional Disparities

India's per capita income grew at an accelerated rate during 1980/81-2004/05 (Table 1). State level trends however vary considerably. Bihar, Orissa and Uttar Pradesh have continued

Table 1: Growth in per capita income of major states, at 1993/94 prices

State	Per capita Gross Domestic Product (GDP), Rupees		Annual compound growth rate in per capita GDP, %	
	1981/83	2003/05	1980/81-1991/92	1992/93-2004/05
Bihar	3773(15)	5280(15)	2.3	2.2
Uttar Pradesh	4332(14)	7156(14)	2.6	1.8
Orissa	4407(13)	7557(13)	2.8	2.7
Rajasthan	4932(12)	10388(11)	3.8	2.9
West Bengal	5293(11)	12917(10)	2.6	5.6
Madhya Pradesh	5601(10)	8955(12)	2.1	1.9
Karnataka	5636(9)	14522(6)	3.5	5.6
Kerala	6068(8)	14257(8)	2.5	4.7
Tamil Nadu	6098(7)	15154(5)	4.0	4.1
Himachal Pradesh	6361(6)	14347(7)	3.5	4.7
Andhra Pradesh	6470(5)	13050(9)	2.0	4.7
Gujarat	7627(4)	18735(2)	2.8	3.7
Maharashtra	8035(3)	19148(1)	3.8	3.3
Haryana	8826(2)	18146(4)	4.0	3.5
Punjab	9927(1)	18438(3)	3.4	2.7
India (15 states)	5730	11767	3.1	3.8
Figures in parentheses are ranks of states				

[1]See, Bajpai and Sachs (1996), Cashin and Sahay (1996), Sachs et al. (2002) and Purfield (2006) for more information.

[2]Some states were reorganized in 2001 as to create new states. The data for new states were merged with their parent states as to maintain continuity in the data series.

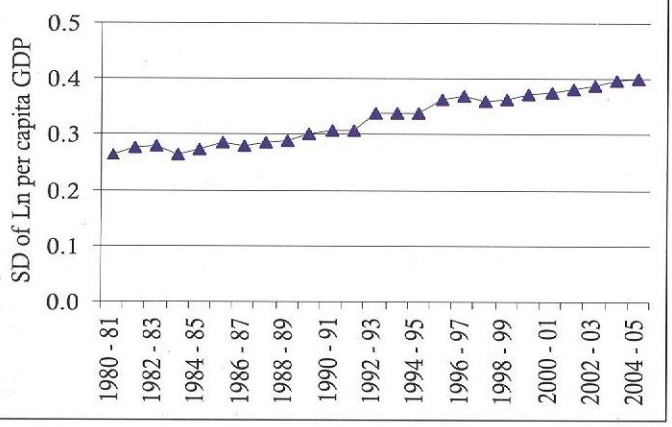
to be laggards, in terms of per capita income as well as growth therein[2]. While states like Punjab, Haryana, Maharashtra and Gujarat have always remained as rich states. Furthermore, the gap between poor and rich states has widened during last 25 years. For instance, the ratio of per capita income of the poorest state Bihar to one of the richest states Punjab has increased to 3.5 in 2003/05 from 2.6 in 1980/82.

To stimulate economic growth and improve well-being of the people, Government of India initiated a programme of economic reforms in July 1991. Some states benefited from these, while others did not. Andhra Pradesh, Himachal Pradesh, Karnataka, Tamil Nadu and West Bengal (categorized as middle income states) recorded rapid and accelerated growth during 1992/93-2004/05. On the other hand, the poorer states (Bihar, Orissa, Uttar Pradesh and Madhya Pradesh) continued to lag behind; and the rich states (except Gujarat) witnessed a deceleration in income growth.

Whether this spatially differentiated pattern of income growth has led to convergence[3] or divergence in income levels across states? We have examined this through the lens of σ-convergence and β-convergence. σ-convergence is defined as the standard deviation in logarithm of per capita income across states, and denotes behavior of cross-sectional dispersion of income over time. It occurs if cross-sectional dispersion in per capita income declines over time. β-convergence shows relationship between growth rates of per capita income and initial level of per capita income of states, and is said to occur if the relationship between the two is negative and significant.

Figure 1 plots standard deviation (SD) of logarithm of per capita GDP of states for the period 1980/81 - 2004/05. The standard deviation increased from 0.26 in 1980/81 to 0.40 in 2004/05 indicating a clear tendency of widening regional disparities. This tendency was stronger in the initial years of economic reforms - the standard deviation grew at an annual rate of 2.6% during 1991/92-1997/98 as against to 1.3% during 1980-81-1991/92 and 1.6% during 1997/98 - 2004/05.

Figure 1: Dispersion of per capita GDP across states, 1980/81-2004/05



Agriculture and Regional Disparities

Inter-state differences in per capita income and growth thereof can be explained by factors like infrastructure development, human capital, technology absorption, and production structure and resource endowments. Public infrastructure is crucial to improve access to markets, to reduce transportation and transaction costs, and to stimulate private investment.

Table 2: Share of agriculture in GDP and employment in Indian states

State	Share of agriculture in GDP (%), at 1993/94 prices		Share of agriculture in total workforce (%)*	
	1981/83	2003/05	1981	2001
Bihar	43.6	30.7	79.1	77.6
Uttar Pradesh	44.4	30.4	74.5	69.2
Orissa	44.8	23.6	74.7	68.1
Rajasthan	43.7	24.9	68.9	67.8
West Bengal	27.3	21.6	55.0	47.7
Madhya Pradesh	36.4	24.4	76.2	75.5
Karnataka	40.0	17.3	65.0	58.1
Kerala	31.2	12.7	41.3	23.7
Tamil Nadu	23.8	12.9	60.9	52.1
Himachal Pradesh	31.1	17.8	70.8	69.7
Andhra Pradesh	38.4	23.5	69.5	65.2
Gujarat	36.3	16.2	60.1	52.7
Maharashtra	22.3	10.5	61.8	56.5
Haryana	47.9	27.8	60.8	52.6
Punjab	48.6	36.9	58.0	40.4
India (15 states)	37.2	21.3	66.5	58.2
*compiled from Census of India, 1981 and 2001.				

Inter-state differences in production structure could be an important cause of regional disparities in income level and growth therein. Generally, the economies dominated by agriculture grow slowly, because of low labour productivity in agriculture. Low labour productivity in agriculture is primarily due to low level of agricultural productivity and excessive employment pressure on agriculture. In most Indian states, despite a drastic decline in agriculture's share in GDP, the employment pressure on agriculture continues to be very high (Table 2), which we consider an important barrier to economic growth and convergence. The barrier of low labour productivity in agriculture to economic

[3]Convergence is the tendency of poor regions to grow faster and catch-up with rich regions (Barro and Sala-i-Martin, 1995).

growth, originating from high employment pressure, can be overcome through application of growth-enhancing labour-intensive technologies at least in the short run. Factors such as investment in agricultural research, total factor productivity, area under high yielding varieties and fertilizer consumption are proxies for technological progress. We have considered fertilizer consumption (per ha of net sown area) - a proxy for technological progress- to look for the role of agricultural technology in reducing regional disparities.

The importance of agricultural conditions vis-à-vis other factors in explaining regional disparities in income growth can be appraised through conditional β-convergence where growth rates of per capita income of states are regressed on their respective initial levels of per capita income alongwith a set of variables considered crucial to economic growth (Barro and Sala-i-Martin, 1995)[4]. If the disparities are narrowing down, then the regression coefficient on initial level of per capita income must be negative and statistically significant.

Estimated convergence equations are presented in Table 3. The coefficient of per capita income in equations I and II is positive and significant, confirming that regional disparities in India have been rising. Equations III to VI identify factors that can accelerate economic growth of the poorer states as to enable them catch-up with the rich states. Road density and literacy make positive and significant contribution to economic growth (Eq. III and IV). This implies that investment in public infrastructure and human capital is crucial to enhance economic growth of the poorer states. However, the investment alone is not sufficient to reduce regional disparities, as the coefficient of per capita income in equations III and IV remains statistically insignificant.

How can then regional disparities be reduced? In equations V and VI we introduce agricultural variables (agricultural workforce and fertilizer consumption) alongwith infrastructure and human capital variables. In equation V the coefficient of agricultural workforce is negative and significant, and the coefficient of per capita income turns out to be strongly negative. The negative and significant coefficient of agricultural workforce indicates that continued high employment pressure on agriculture is an important cause of sluggish growth of the poorer states; and the strongly negative sign on per capita income suggests that after controlling for employment pressure on agriculture the states move towards an identical growth path. In other words, if the poor states were to catch-up with the rich states it is imperative to reduce employment pressure on agriculture by forging strong backward and forward linkages of agriculture with non-agricultural sectors. Further, in equation VI the coefficient of fertilizer use intensity is positive and significant, and the coefficient of per capita income increases in magnitude and significance, which indicates a critical role of agricultural technology in accelerating economic growth and reducing regional disparities.

Table 3: Determinants of income growth and convergence

Explanatory variables	Equation I	Equation II	Equation III	Equation IV	Equation V	Equation VI
Per capita income (Rs)	0.0198 (2.458)**	0.0199 (1.485)	-0.0041 (0.315)	-0.0221 (1.290)	-0.0406 (2.293)**	-0.0475 (2.727)***
Road density (km/100sq.km)	-	-	0.0527 (4.484)***	0.0407 (3.175)***	0.0432 (3.447)***	0.0414 (3.245)***
Literacy rate (%)	-	-	-	0.00098 (1.869)*	0.00094 (1.919)*	0.00047 (0.767)
Share of agriculture in total work force (%)	-	-	-	-	-0.0017 (1.769)*	-0.0022 (2.226)**
Fertilizer use (kg/ha)	-	-	-	-	-	0.0189 (1.910)*
Reforms;1980/81-1991/92 =0; otherwise =1	-	-0.00005 (0.008)	-0.00562 (1.027)	-0.0096 (1.709)*	-0.0086 (1.575)	-0.0154 (2.769)***
No. of observations	75	75	75	75	75	75
R-squared	0.3364	0.3364	0.4366	0.4689	0.5018	0.5335
Adjusted R-squared	0.1677	0.1534	0.2685	0.2983	0.3297	0.3607
F-statistic	1.99**	1.84**	2.60***	2.75***	2.92***	3.09***
Log-likelihood	206.610	206.616	212.752	214.971	217.368	219.829

Note: Per capita income, road density and fertilizer use are in log terms.
Figures in parentheses are t-values. ***, ** and * indicate significance at 1, 5 and 10% respectively.

[4]Equation for conditional β-convergence can be written as: $\Delta y_{it} = \beta y_{it} + \gamma x_{it} + \varepsilon_{it}$; where y_{it} is per capita income of state i at the beginning of the period, Δy_{it} is growth rate of per capita income during the period, x_{it} is a set of variables (literacy, labour force, fertilizer consumption, road density, etc.) that influence growth, and eit is random disturbance. We use panel data specification to estimate β-convergence. The entire period, from 1980/81 to 2004/05, was divided into five sub-periods - each comprising of a panel of five years. We estimated panel data fixed effects regressions using Maximum Likelihood.

Policy Issues

Regional disparities in India are increasing due to significant cross-state differences in physical infrastructure, human capital and agricultural conditions. Our results suggest that the poorer states will grow faster and catch up with rich states if these cross-state differences are controlled for. Hence, to accelerate economic growth of poorer states we need a mutli-pronged strategy encompassing improvements in infrastructure and quality of human resources, reduction in employment pressure on agriculture and diffusion of agricultural technologies.

Infrastructure and human capital are important sources of growth; hence to enhance economic growth of poorer states there is a need for greater investment in public infrastructure (roads, electricity, telecommunication, etc.) that generates widespread benefits and also induces private sector investment. Further, as the economy takes off and diversifies towards non-agricultural sectors it would require quality labour force to sustain the growth trajectory, and hence increased investment in human resource development.

However, the investment in physical infrastructure and human resources alone is not sufficient to reduce regional disparities. In most poor states employment pressure on agriculture continues to be very high, which, in fact is an important barrier to enhancing economic growth there. Hence, to reduce regional disparities the investment in infrastructure and human resources must be accompanied by a reduction in employment pressure on agriculture which can be accomplished by improving labour market linkages of agriculture both within and outside the agricultural sector. This is important as the Indian agriculture is dominated by small landholdings, and the labour absorption capacity of agriculture has almost exhausted. With this in view, there is a strong and long-felt need to expand income generating activities in the non-farm sector.

Though, role of technology in enhancing agricultural and economic growth is well recognized in India, there remain considerable regional disparities in adoption of technologies and realization of their true potential. Rapid and widespread diffusion of technologies in agriculturally backward regions will enhance agricultural productivity and contribution of agriculture to economic growth. This calls for more allocation of resources to agricultural research and development activities. A related strategy to enhance the contribution of agriculture to economic growth is to promote diversification of agricultural sector towards enterprises like horticulture, animal husbandry and fisheries that are labour-intensive and generate larger returns to land and capital.

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