

SUBJECT I
DISADVANTAGED REGIONS AND PEOPLE: IS THERE A WAY FORWARD?

Financial Inclusion through Kisan Credit Cards in Disadvantaged Region like Arunachal Pradesh – Is There District-Level Convergence?

Samir R. Samantara*

ABSTRACT

Arunachal Pradesh, though strategically very important, is one of the most backward States in the country in the traditional sense of economic parameters. The long isolation and separation from the main stream of the country, posed formidable problems to the efforts of socio-economic development of the State. This paper examines the question of convergence in Arunachal Pradesh agriculture since the last decade. It focuses on the questions of (a) whether there has been a catching-up tendency (β -convergence) of slow-growing districts with fast-growing ones; and (b) whether there has been a tendency towards convergence (σ -convergence) in agricultural productivity in the last one decade (2000-2010) over a representative cross-section of Arunachal Pradesh districts. The paper also tests the operation of Galton's fallacy through growth-terminal level regressions for robustness of the results. The tendency of low-KCC concentration districts to catch up with high-KCC concentration districts is studied through the unconditional β -convergence approach, and the operation of Galton's fallacy through growth-terminal agricultural productivity-level regressions. The diminution of variance in productivity levels is tested using the σ -convergence approach and the robustness of the results is tested using alternative test statistics.

Keywords: Financial inclusion, Kisan credit cards.

JEL: Q14, Q15

I

INTRODUCTION

Arunachal Pradesh, though strategically very important, is one of the most backward States in the country in the traditional sense of economic parameters. The long isolation and separation from the main stream of the country, posed formidable problems to the efforts of socio-economic development of the State.¹ Further, the State's inhospitable topography, challenging climatic conditions and communication bottle-necks make the cost of creation and maintenance of infrastructure extremely high. Arunachal Pradesh is situated in the North- Eastern part of India with 83743 sq. kms area and has a long international border with Bhutan to the west (160 km), China

*Deputy General Manager and Faculty Member, Banker's Institute of Rural Development (BIRD), Lucknow.

The view expressed are those of the author and not of the organisation he belongs to. Usual disclaimer applies.

The author acknowledge the various sources viz., Research articles submitted to Fordham University (accessed on 15 March 2015), Westminster International University in Tashkent (accessed on 01 May 2015), University of Antwerp (accessed on 21 November 2007 and 15 November 2010), University of Bath (accessed on 30 August 2012).

to the north and north-east (1,080 km) and Myanmar to the east (440 km). It stretches from snow-capped mountains in the north to the plains of Brahmaputra valley in the south.² The state has 18 districts, 27 census towns and 3863 inhabited villages with a bank network of 88 branches of commercial banks, 27 branches of Arunachal Pradesh Rural Bank (APRB) and 32 Branches of Arunachal Pradesh State Cooperative Apex Bank (APSCAB) Ltd.

II

DATA AND METHODOLOGY

This paper examines the question of convergence in Arunachal Pradesh agriculture since the last decade. It focuses on the questions of (a) whether there has been a catching-up tendency (β -convergence) of slow-growing districts with fast-growing ones; and (b) whether there has been a tendency towards convergence (σ -convergence) in agricultural productivity in the last³ one decade (2000-2010) over a representative cross-section of Arunachal Pradesh districts. It also tests the operation of Galton's fallacy through growth-terminal level regressions for robustness of the results. The tendency of low-KCC concentration districts to catch up with high-KCC concentration districts is studied through the unconditional β -convergence approach, and the operation of Galton's fallacy through growth-terminal agricultural productivity-level regressions. The diminution of variance in productivity levels is tested using the σ -convergence approach and the robustness of the results is tested using alternative test statistics. Concentration of short-term credit in the form of KCC in agriculture is the total short term credit in agriculture per hectare of net sown area, and agricultural productivity is the agriculture production per hectare of net sown area. Details on the district-wise short-term KCC loans and agricultural productivity were collected from the Potential Credit Plans published from NABARD. Details on nets own area were obtained from the State Directorate of Economics and Statistics, Government of Arunachal Pradesh.

On the empirical front, modelling and testing the convergence hypothesis is far from settled. As Islam (2003) observes, either conditional or unconditional, the informal and formal cross-section approaches, the panel approach, and the time series approach (in part) have all studied β -convergence.⁴ The formal cross section approach and panel approach have been used to study club-convergence and total factor productivity (TFP) convergence. The time series approach has been used to investigate convergence both within an economy and across economies. But the cross section and panel approaches suffer from endogeneity bias, since variables such as investment growth rate in agriculture and agricultural productivity growth rate used as explanatory variables in growth-convergence equations are likely to be jointly determined. Despite the observations of Hotelling (1933), Friedman (1992), Lichtenberg (1994), and Sala-i-Martin (1996) and the criticisms of Quah (1993), researchers have continued to be interested in β -convergence for the reason that σ -

convergence requires β -convergence. The other reason is that β -convergence could provide information on the structural parameters of growth models.⁵ The present study investigated both (unconditional) β -convergence and σ -convergence in short-term KCC loan and agricultural productivity across districts in Arunachal Pradesh. Along with the growth-initial productivity regressions to study β -convergence, the study also fitted growth-terminal productivity regressions to test Galton's fallacy.

The Model

(a) β -Convergence and Galton's Fallacy

Following Sala-i-Martin's (1996) exposition, the present study uses the following equation to investigate unconditional β -convergence across districts. Assume that β -convergence holds for districts $i = 1, 2, \dots, N$. Natural log-income of i -th district at time 't' can be approximated by,

$$\ln y_{i,t} = \alpha + (1 - \beta) \ln(y_{i,t-1}) + u_{i,t} \quad \dots(1)$$

where $y_{i,t}$ is credit (or agriculture) productivity in district 'i' at time t, $0 < \beta < 1$ and $u_{i,t}$ has zero mean, finite variance, $\sigma^2_{u_i}$, and is independent over 't' and 'i'. Since α is assumed to be constant across districts, balanced growth paths are identical (allowing different α_i s for $0 < \beta < 1$ would imply conditional β -convergence).

Manipulating equation (1) yields,

$$\ln(y_{i,t} / y_{i,t-1}) = \alpha - \beta \ln(y_{i,t-1}) + u_{i,t} \quad \dots(2)$$

Thus, $\beta > 0$ implies a negative correlation between growth and initial log productivity. Between any period t and t + T, equation (2) can be written as

$$(1/T) \ln(y_{i,t+T} / y_{i,t}) = \alpha - \beta \ln(y_{i,t}) + u_{i,t} \quad \dots(3)$$

Replacing $y_{i,t}$ on the right-hand side of equation (3) with $y_{i,t+T}$,⁶

$$(1/T) \ln(y_{i,t+T} / y_{i,t}) = \alpha - \beta \ln(y_{i,t+T}) + u_{i,t} \quad \dots(4)$$

Equation (4) refers to the relation between growth and the terminal year. $\beta > 0$ in equation (3) and a consequent $\beta < 0$ in equation (4) represent Galton's fallacy, observed in Friedman (1992). The growth rates obtained in Equations (3) and (4) consider only the initial and terminal year productivity levels and ignores values in the rest of the period. To avoid this limitation, the present study used trend growth rate in equations (3) and (4) given by,

$$r_i = \alpha - \beta \ln(y_{i,t}) + u_{i,t} \quad \dots(3a)$$

$$r_t = \alpha - \beta \ln(y_{i,t+T}) + u_{i,t} \quad \dots(4a)$$

where r_t is the trend growth rate between any two time period t and $t + T$, which can be obtained from the ordinary least squares (OLS) estimate β in the following regression.

$$\ln y_t = \alpha - \beta t \quad \dots(5)$$

$$r = \exp(\beta) - 1 \quad \dots(6)$$

where y_t is credit or agriculture productivity at time 't'.

(b) σ -Convergence

Existence of β -convergence may necessarily not imply σ -convergence among districts. The (σ) convergence hypothesis is that

$$\frac{d[\text{var}(\ln(y_{i,t}))]}{dt} < 0 \quad \dots(7)$$

where $y_{i,t}$ is credit (or agriculture) productivity in district 'i' at time t and $\text{var}(y_{i,t})$ denotes variance across districts. Equation (5) can be formally tested (McCunn and Huffman, 2000) using var

$$[\ln(y_{i,t})] \varphi_1 + \varphi_2 t + \varepsilon_t \quad \dots(8)$$

where ε_t is a zero mean random disturbance term.⁷ Sufficient condition for productivity (credit or agriculture) convergence across districts is that φ_2 is negative and significantly different from zero. When φ_2 is not significantly negative, unconditional convergence does not occur, or growth rates across districts may diverge over time. To test the robustness of the results (σ -convergence), the study⁸ followed the tests suggested by Lichtenberg (1994) and Caree and Klomp (1997). Lichtenberg (1994) shows that the test of mean-reversion hypothesis $\beta < 0$ (based on the t distribution with $n-2$ degrees of freedom) is equivalent to a test of

$$T_1 = \{\text{var}(\ln y_{i,t})\} / \{\text{var}(\ln y_{i,t+T})\} = R_2 / (1 + \beta)^2 > 1 \quad \dots(9)$$

where $y_{i,t}$ and $y_{i,t+T}$ are productivity levels in initial and terminal years of any given time period t and $t + T$. The test statistic⁹ follows F distribution $N-2$, $N-2$ degrees of freedom where N represents the number of districts. Caree and Klomp (1997) show that the test statistic proposed by Lichtenberg (1994) "overlooks the dependency between the two variances, and hence probabilities of committing a type II error of incorrectly rejecting the convergence hypothesis are large", in particular in shorter time periods. They propose two alternative test statistics¹⁰ that are robust to shorter time periods given by

$$T_2 = (N - 2.5) \ln \left[1 + \frac{1(\sigma_1^2 - \sigma_T^2)^2}{4(\sigma_1^2 \sigma_T^2 - \sigma_{1T}^2)} \right] \dots(10)$$

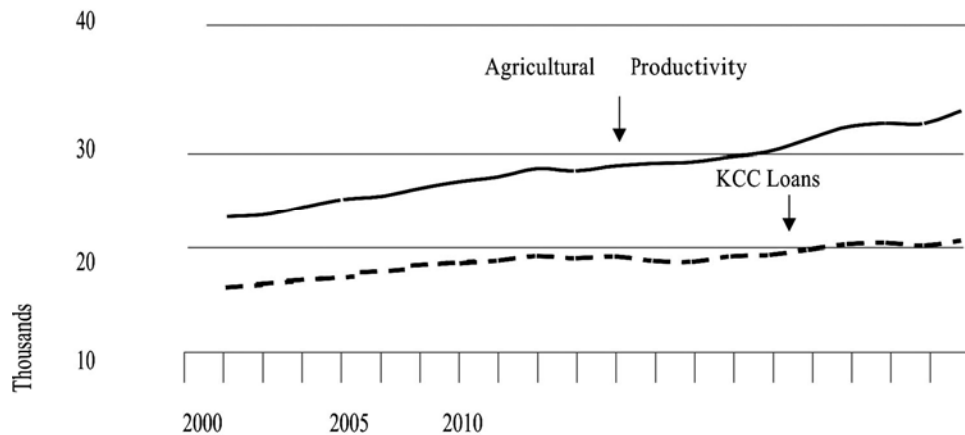
$$T_3 = \left[\sqrt{N} \left(\frac{\sigma_1^2}{\sigma_T^2} - 1 \right) / \left\{ 2\sqrt{1 - \Pi^2 N} \right\} \right] \dots(11)$$

The test statistic T_2 has χ^2 (1) distribution and T_3 has a normal distribution with $N-1$ degrees of freedom. The paper computed all T_1 , T_2 and T_3 statistics in investigating the convergence hypothesis.

III

FINDINGS AND DISCUSSION

Trends in KCC loans and agricultural productivity in Arunachal Pradesh agriculture between 2000 and 2010 are shown in Figure 1. Agricultural productivity was calculated as the ratio of agriculture production per hectare of net area sown and the extent of KCC loans was calculated as the ratio of KCC loans disbursed per hectare of net area sown in agriculture. To account for year-to-year fluctuations, growth rates were estimated from two-year moving averages of the data series. The average agricultural productivity increased consistently through the period with an average growth of 2.34 per cent per annum. The 2000-2005 period registered an annual growth of 2.21 per cent and it increased slightly to 2.47 per cent in the 2005-2010 period. The average KCC loans also increased, but not as much average agricultural productivity. The average KCC loans growth attained during 2000-2010 (1.14 per cent) was less than the growth realised in agricultural productivity. But unlike KCC loans, where growth was almost equal in both the periods, agricultural productivity increased significantly for the same period. Such an upward shift in agricultural productivity growth could be attributed to a significant increase in agricultural production.



Source: Author's estimates.

Figure 1. KCC Loan and Agricultural Productivity Trends in Arunachal Pradesh Agriculture (2000-2010).

Though the magnitudes differed, KCC loans grew in all the districts between 2000 and 2010. The growth was highest in East Siang (3.58 per cent), followed by East Kameng (2.90 per cent) and Upper Siang (2.82 per cent), while districts such as Lower Dibang Valley (2.14 per cent), Tawang (1.46 per cent), Anjaw (1.16 per cent) and Tirap (1.14 per cent) ameliorated (Table 1). Contrary to KCC loans, a large number of districts achieved significant growth in agricultural productivity. They included East Kameng (3.92 per cent), Lower Dibang Valley (3.34 per cent) and Dibang Valley (3.13 per cent). All the other districts recorded growth rates in the range of 1-3 per cent during 2000-2010.

TABLE 1. KCC LOANS AND AGRICULTURAL PRODUCTIVITY GROWTH IN ARUNACHAL PRADESH (2000-2010)

(1)	Districts (2)	Average. KCC loan (in `.) (3)	Average agricultural productivity (kg/ ha.) (4)	Average annual growth	
				KCC loans (5)	Agricultural productivity (6)
1	Tawang	40562	1543	1.46	2.60
2	West Kameng	44263	1521	-0.52	0.91
3	East Kameng	46897	1523	2.90	3.92
4	Papumpare	51452	1625	1.22	2.25
5	Lower Subansiri,	58452	1765	0.61	2.59
6	Upper Subansiri	59325	1423	0.32	2.82
7	East Siang	45623	1670	3.58	2.28
8	West Siang	58429	1546	0.50	2.16
9	Upper Siang	44369	1495	2.82	1.54
10	Dibang valley	45442	1356	0.21	3.13
11	Lower Dibang valley	44289	1564	2.14	3.34
12	Lohit	51235	1452	0.12	2.57
13	Changlang	49648	1523	0.76	1.32
14	Tirap	52369	1654	1.14	2.11
15	Kurung Kumey	58796	1578	0.73	2.16
16	Anjaw	54278	1469	1.16	1.89
17	Longding	59985	1546	0.21	2.32

Source: Author's estimates.

Productivity of major crop (Rice) has been taken proxy for agricultural productivity¹¹

Convergence in Productivity

β -Convergence: As mentioned earlier, the convergence phenomenon was studied for different periods. First, convergence in KCC loans and agricultural productivity was studied for the entire period (2000-2010). Subsequently, this period was divided into two sub-periods – 2000-2005 and 2005-2010 to study the convergence phenomenon in two different periods. To test whether the speed of convergence had been higher after 2005, attempt has been made to study the convergence during 2000-2005 and 2005-2010. The growth-initial productivity regression for 2000-2010 supported existence of β -convergence in KCC loans growth across the districts (Table 2A). The coefficient of KCC loans in the initial year (2000) against growth was negative (- 1.172) and it was highly significant (p value = 0.031), indicating that

the districts with lower KCC loans grew faster than the districts with high KCC loans (Figure 2A). KCC loans growth was highest in East Siang (3.58 per cent), followed by East Kameng (2.90 per cent) and Upper Siang (2.82 per cent), But, in absolute terms, it was low in these districts, that is, ` . 45,623 per hectare (ha) in East Siang, ` . 46,897/ha in East Kameng, and ` . 44,369/ha in Upper Siang against the State average of ` . 50,906/ha in 2010. Other districts that grew fast despite low initial KCC loans were Tawang and Lower Dibang Valley. Annual average KCC loans growth in these districts between 2000 and 2010 was 1.46 per cent and 2.14 per cent, respectively. On the other hand, districts such as Lower Subansiri, Upper Subansiri, Kurung Kumey and Longding, where the initial KCC loans level was relatively high, grew by less than 1.0 per cent. Thus, while districts with low KCC loans grew faster, by more than 2 per cent, high KCC loans districts grew by less than 1 per cent, indicating a strong (β) convergence across them.

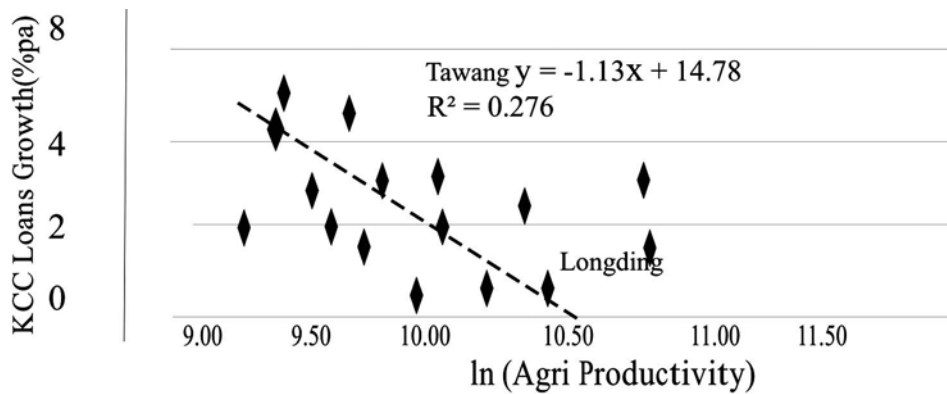
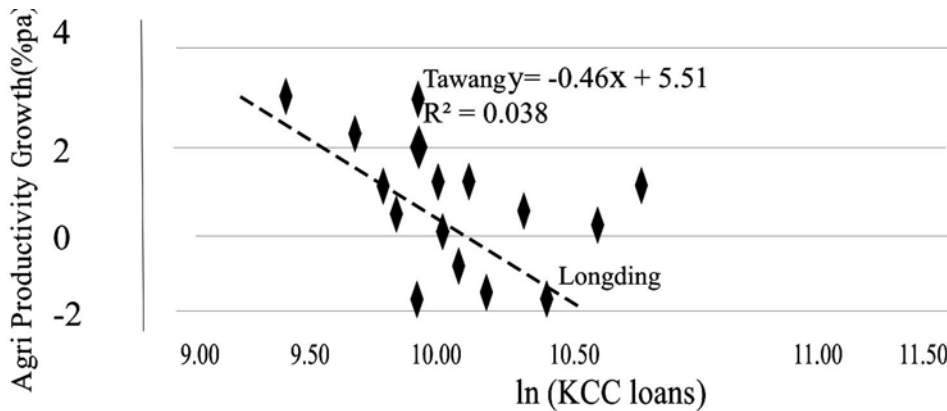


Figure 2A. Beta Convergence in KCC Loans (2000-2010).



Source: Author's estimates.

Figure 2B. Beta Convergence in Agricultural Productivity (2000-2010).

As one can see from Table 2A, the speed of convergence (coefficients of the initial years in growth-initial productivity regressions) decreased over time, while the speed of convergence remained more or less unaltered in both the periods (1.53 per cent), with a significant drop in p-values, from 1.46 per cent during 2000-2005 to 1.20 per cent during 2005-2010. Moreover, for 2005-2010, the convergence hypothesis could not be established strongly, indicated by low significance of the coefficient corresponding to the initial productivity variable (p-value = 0.270). This evidence is against the general belief that low productivity districts performed better during 2005-2010. For example, between 2000 and 2010, low-productivity districts such as Lower Subansiri (2.59 per cent), Upper Subansiri (2.82 per cent), Kurung Kumey (2.16 per cent) and Longding (2.32 per cent) performed relatively better than west Kameng (0.91 per cent), Upper Siang (1.54 per cent), and Changlang (1.32 per cent), the districts with relatively high initial KCC loans levels. But the speed of convergence across districts between 2000 and 2010 was masked by the underperformance of west Kameng, which registered a negative growth rate (−0.52 per cent) during this period. Having the lowest initial KCC loans level (₹ 44,263/ha), a negative growth rate in the district masked the efforts of better-performing districts. Thus, the paper supports the existing literature of relatively better performance of districts over 2005-2010.

TABLE 2A. β -CONVERGENCE AND GALTON'S FALLACY IN KCC LOANS (2000-2010)

Explanatory variable	Dependent variable				
	Coef	P> t	R2	Shapiro-Wilk P> z	White P> χ^2
(1)	(2)	(3)	(4)	(5)	(6)
Period: 2000-2010 KCC loans growth (2000-2010)					
ln (KCC loans) -2000	-1.172	0.031	0.273	0.568	0.458
ln (KCC loans) -2010	-0.578	0.422	0.043	0.326	0.814
Period: 2000-2005 KCC loans growth (2000-2005)					
ln (KCC loans) -2000	-1.533	0.037	0.260	0.846	0.465
ln (KCC loans) -2005	-0.794	0.366	0.055	0.554	0.286
Period: 2005-2010 KCC loans growth (2005-2010)					
ln (KCC loans) -2005-1.520	0.108		0.163	0.764	0.654
ln (KCC loans) -2010-0.325	0.764		0.006	0.729	0.936

Contrary to KCC loans growth, the analysis failed to reject the null hypothesis of no (β) convergence in agricultural productivity in different periods. This was shown by the negative but insignificant coefficients and much lower coefficients of determination in the growth-initial year agricultural productivity regression (Table 2B). No tendency to grow faster was observed in the low-agricultural productivity districts, or to slow growth in the high-agricultural productivity districts. The average agricultural productivity was the highest in East Siang (1670 kg/ha.), followed by Tirap (1654 kg/ha) and Papumpare (1625 kg/ha). Between 2000 and 2010, while agricultural productivity grew by 2.16 per cent, 2.11 per cent and 2.25 per cent in East Siang, Tirap and Papumpare respectively. In contrast, Dibang Valley, which had

the lowest agricultural productivity (1356 kg/ha), grew by 3.13 per cent, just below Papumpare (3.34 per cent) and East Kameng (3.92 per cent), the districts with the higher agricultural productivity growth. Thus, the results did not establish β -convergence in agriculture productivity.

TABLE 2B. β -CONVERGENCE AND GALTON'S FALLACY IN AGRICULTURAL PRODUCTIVITY (2000-2010)

Explanatory variable	Explained variable				
	Coef	P> t	R2	Shapiro-Wilk P> z	White P> χ^2
(1)	(2)	(3)	(4)	(5)	(6)
Period: 2000-2010 Agricultural productivity (2000-2010)					
ln (agricultural productivity) -2000	-0.473	0.447	0.039	0.662	0.923
ln (agricultural productivity) -2010	0.348	0.574	0.022	0.215	0.208
Period: 2000-2005 Agricultural productivity growth (2000-2005)					
ln (agricultural productivity) -2000	-0.953	0.376	0.053	0.293	0.785
ln (agricultural productivity) -2005	0.697	0.532	0.027	0.176	0.019
Period: 2005-2010 Agricultural productivity growth (2005-2010)					
ln (agricultural productivity) -2005	-0.224	0.819	0.004	0.645	0.701
ln (agricultural productivity) -2010	0.909	0.329	0.064	0.833	0.533

Source: Author's estimates.

Galton's Fallacy

The tendency to converge (β -convergence) disappears when the growth is plotted against the terminal year rather than the initial year, and the entities tend to diverge rather than converge. This phenomenon is referred as Galton's fallacy or statistical (regression) fallacy (Friedman, 1992). Hotelling (1933) observed this phenomenon and referred to it as a statistical fallacy resulting from the method of grouping¹² and suggested σ -convergence was superior to β -convergence. This paper, in addition to investigating β -convergence through productivity regressions, also examined the operation of so-called Galton's fallacy through growth-terminal productivity regressions in KCC loans and agriculture productivity (Tables 2A and 2B). It failed to establish such statistical fallacy both in KCC loans and agriculture productivity in all the periods. The β -convergence observed in the growth-initial productivity regressions did not persist when growth rates were regressed against terminal years rather than the initial years, shown by the negative and highly insignificant terminal year KCC loans coefficients and the lowest coefficients of determination in different periods. Thus, the seemingly converging tendency in the growth-initial level regressions turned up to have no relation in the growth-terminal productivity regressions. The results of agricultural productivity regressions proved the same, except the difference of the positive terminal productivity coefficients. The results invalidated the assumption of superiority of σ -convergence over β -convergence as argued by Hotelling (1933) and Friedman (1992). Since β -convergence is a necessary but not a sufficient condition for convergence, the σ -convergence approach was employed.

σ -Convergence: The trend in cross-sectional dispersion of KCC loans and agricultural productivity in all the districts was studied using standard deviation in a natural logarithm as a measure of dispersion. The results obtained by regressing standard deviation of (natural logarithm) KCC loans and agriculture productivity against the time variable are shown in Table 3A. To test the robustness of the results,¹³ the test statistics suggested by Lichtenberg (1994) and Caree and Klomp (1997) were calculated and the results are in Table 3B.

TABLE 3A. σ -CONVERGENCE IN KCC LOANS GROWTH AND AGRICULTURE PRODUCTIVITY (2000-2010)

Explained Variable	Coef	P> t	R2	Shapiro-Wilk P> z	Breusche- Godfrey P> χ^2
(1)	(2)	(3)	(4)	(5)	(6)
Period: 2000-2010					
SD [ln (KCC loans)]	-0.005	0.000	0.802	0.994	0.355
SD [ln (Agri. productivity)]	-0.001	0.824	0.003	0.932	0.069
Period: 2000-2005					
SD [ln (KCC loans)]	-0.006	0.044	0.416	0.998	0.413
SD [ln (Agri. productivity)]	-0.002	0.625	0.031	0.608	0.164
Period: 2005-2010					
SD [ln (KCC loans)]	-0.005	0.000	0.776	0.868	0.913
SD [ln (Agri. productivity)]	0.002	0.093	0.281	0.060	0.972

TABLE 3B. RESULTS OF ALTERNATIVE TEST STATISTICS OF σ -CONVERGENCE

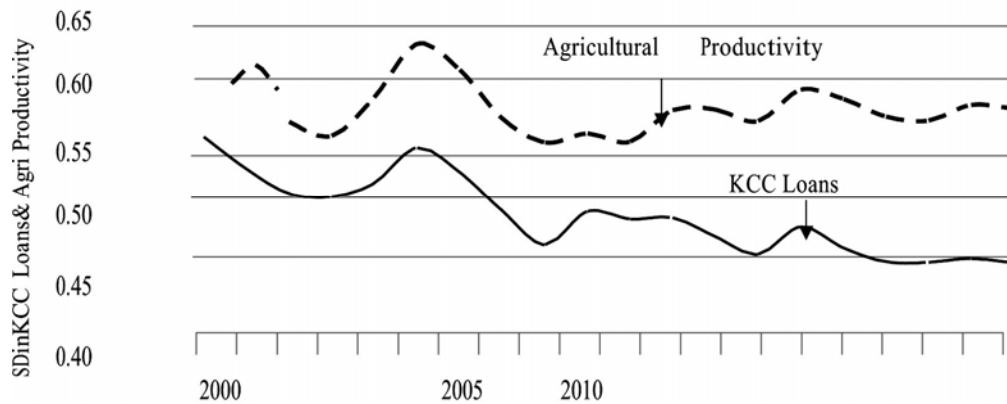
(1)	Variable		Lichtenberg (1994)		Caree and Klomp (1997)	
	T ₁ Critical (2)	F (3)	T ₂ Critical (4)	χ^2 (5)	T ₃ Critical (6)	t (7)
Period: 2000-2010						
ln (KCC loans)	1.530	2.400	4.003	3.841	1.645	1.746
ln (Agri. Productivity)	0.981	2.400	0.009	3.841	-0.109	1.746
Period: 2000-2005						
ln (KCC loans)	1.271	2.400	1.792	3.841	1.021	1.746
ln (Agri. Productivity)	1.059	2.400	0.070	3.841	0.262	1.746
Period: 2005-2010						
ln (KCC loans)	1.203	2.400	0.990	3.841	0.807	1.746
ln (Agri. productivity)	0.927	2.400	0.198	3.841	-0.811	1.746

Source: Authors' estimates.

Critical values are significant at 5 and 10 per cent level; critical values for T₁, T₂ and T₃ will be 1.970, 2.705, and 1.337, respectively.

Plotting the coefficient of variation against time showed that except in few years dispersion in KCC loans across districts declined gradually (Figure 3). The coefficients of the time variable were negative and highly significant¹⁴ in all the periods, except 2005-2010. For 2005-10, though the coefficient was negative, it was significant only at the level of 17.5 per cent. These results are inconsistent with those obtained in the β -convergence approach (note that in the β -convergence approach, for 2000-2010, convergence can be established at 11 per cent significance level). Thus,

the paper rejected the null hypothesis of no convergence in KCC loans. The test statistic T_1 failed to establish convergence in KCC loans in different periods, thereby supporting the view of Caree and Klomp (1997) that the T_1 statistic is biased towards finding no convergence. Both T_2 and T_3 statistics established convergence for 2000-2010, but they failed to do so for the other periods (note that T_3 statistics established convergence at 10 per cent significance levels in these periods), as observed in earlier approaches of convergence analysis.



Source: Author's estimate.

Figure 3. Sigma Convergence in KCC Loan and Agricultural Productivity (2000-2010).

Unlike KCC loans, no trend was observed in the standard deviation of agricultural productivity. The time coefficients in this case were, although negative in most of the regressions, insignificant (except for 2000-2010, where the coefficient was significant at 10 per cent level). Hence, the study could not reject the no convergence null hypothesis in the case of agricultural productivity. Similar results were obtained in the alternative tests. A consistent increase in KCC loans is found in all the districts since 2000. The growth in KCC loans has been higher in districts that had low initial (KCC loans) levels than in districts with high levels of initial (KCC loans) levels. Thus, the comparatively “agriculturally poor” districts, if not all, were able to catch up with the “agriculturally rich” districts, demonstrating β -convergence. Although the growth of KCC loans varied across districts, the average speed of convergence remained more or less equal during the both the periods. However, the speed of convergence was the highest during 2005-2010 than in any other period considered in the paper. As a result, the inter-district differences in KCC loans growth have significantly declined in the State. Hence, there has been σ -convergence as well. But increase in agricultural productivity has been consistent only in a few districts, and many of the districts grew irrespective of their initial agricultural productivity levels.

Therefore, there has been no catching up in agriculture productivity. Neither did the low (agriculture) productivity districts grow faster, nor did the high (agriculture) productivity districts register slow growth to demonstrate the catching-up or β -convergence process. Also, there was no significant change in the variation in agricultural productivity and it has remained stable over the past one decade, indicating no σ -convergence. These tendencies are likely to continue in Arunachal Pradesh agriculture unless adequate investments or technological interventions are made to enhance agriculture productivity. This will also help in credit deepening and credit widening (both horizontal and vertical financial inclusion) through KCC loans, leading to a further convergence.

SUMMARY AND CONCLUSIONS

Strategic planning and implementation is necessary to develop agriculture and make North East Region (NER) in general, Arunachal Pradesh in particular, marginally, if not significantly, surplus in food production by integrating research, extension and education duly supported by a time bound reforms in land tenure system in the State. Agricultural development strategy has to be evolved depending on the resources, conditions and people's needs and priorities. Private sector participation can provide additional resources and create necessary environment to generate job opportunities, better utilisation of resources and enhance credit flow impacting directly on farm sector development. With appropriately defined targets, clear outcomes, strategies and coordinated planning, Arunachal Pradesh can become increasingly self-reliant in food output. Effective computer-based monitoring and management information system can facilitate timely implementation of programmes with improved quality and service delivery that can avoid cost and time over runs and yield envisioned results.¹⁵ "Since banks have a significant role as a catalyst to accelerate the process of agricultural development in Arunachal Pradesh they should be pro-active and make financial services available to the farmers by establishing branches at strategic locations and through technology applications. In a time bound programme, they can provide Kisan Credit Cards to all farmers and where necessary link with insurance companies to facilitate farmers' access to insurance products. They can design simple borrower-friendly lending policy, procedure, documentation and customised and flexible financial products that match needs of the farmers in Arunachal Pradesh rather than one-fits-all for the country as a whole. The factors responsible for low performance as compared to targeted include, *inter alia*, difficult topography, sparse population settlements, inadequate infrastructure, discouraging land tenure system, lack of agricultural entrepreneurship, massive amount of grants and subsidies under Government programmes, and law and order conditions in some parts of the state. The State Governments should create enabling environment that can improve credit absorption capacity of farmers and geographical areas, accelerate flow of credit and loan recovery simultaneously. Banks, Government and

print/electronic media can launch massive campaign to create awareness among farmers to avail financial services”.

NOTES

1. http://www.arunachalplan.nic.in/html/docs/1_profile_arp.pdf (viewed on 11 July 2014).
2. <http://aathiyaholidays.com/content.aspx?Id=36> (viewed on 10 November 2014).
3. See Mukherjee (2003).
4. See Islam (2003).
5. <http://www.mtk.ut.ee/orb.aw/class=file/action=preview/id=324072/febawb60.pdf> (viewed on 22 May 2010).
6. http://mpira.ub.uni-muenchen.de/60201/7/MPRA_paper_60201.pdf (viewed on 15 December 2014).
7. See McCunn and Huffman (2000).
8. <http://www.oesr.qld.gov.au/queensland-by-theme/economic-performance/single-publications/productivity-reg-econ-performance-au/productivity-reg-econ-performance-au.pdf> (viewed on 16 February 2010).
9. <http://ageconsearch.umn.edu/bitstream/20175/1/sp04pa04.pdf> (viewed on 15 November 2014).
10. See Carree and Klomp (1997).
11. Though the author acknowledge this as limitation of the present research, but it may not affect the overall results and interpretations.
12. http://www.firm.net.au/resources/pdfs-papers-slides/Paper_UniMelb_Chen.pdf (viewed on 13 April 2010).
13. See Resende (2011).
14. <http://www.ippg.org.uk/papers/dp29.pdf> (viewed on 06 October 2013).
15. <http://indiamicrofinance.com/agricultural-in-north-east-india.html> (viewed on 02 June 2014).

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