Consumption and Asset Structure in Village India 1975-84 *

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Abstract

As one of the most important determinants of the quality of rural life in India, this paper quantitatively investigates the dynamics of consumption by village households. The investigation is based on a household panel data set collected during the period from 1975 to 1984 from three villages in Peninsular India. Estimation results show that the sample households as a whole witnessed gradual improvement in real consumption per capita although it fluctuated substantially across households. The fluctuation is decomposed into shocks common to all the villagers and idiosyncratic shocks (shocks specific to individual households). Decomposition results demonstrate that households with higher socio-economic positions are less vulnerable to idiosyncratic shocks and more willing to bear common risk. This pattern of resource allocation could be efficient in the static setting but could lead to more inequality and more isolation of the poor from economic growth when the rural economy enters into a period of rapid and dynamic transformation. Recent developments in the study villages partially support the relevance of the latter implication.

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1 Introduction

India's rural economy has witnessed continuous changes in the direction of more market based principles. The pace of these changes has been accelerated since the "Economic Reforms" beginning from 1991. During this transformation, how has the quality of rural life been changed? This is the general issue addressed in this paper.

More specifically, we analyze the dynamics of real consumption per capita using household data collected during the period from 1975 to 1984. The major objective of this paper is to relate quantitatively the dynamics of consumption of individual villagers with their economic and social positions in the village. From this empirical analysis, we would like to derive implications to recent changes in Indian economy.

The reason we focus on real consumption per capita is that it is one of the most representative measures of well-being. Welfare of rural people is closely affected by the speed of its growth as well as its stability. Our focus on consumption, however, does not intend to ignore other important aspects of well-being such as education, health, gender equality, political/community participation, etc.[1] The sole purpose of our focus is to shift the concern from income, which is only a means to achieve well-being.

Another important feature of our focus is that the unit of analysis is a household. In a country like India, aggregate macroeconomic measures are often misleading, hiding diverse heterogeneity among individuals.[2] The dynamics of consumption should vary across households depending on their social and economic positions in the village including their assets. Detailed information on the dynamics of assets and consumption is only available from micro surveys. Therefore, we use a unique household data set collected by the ICRISAT (International Crops Research Institute for the Semi-Arid Tropics). The panel data set used in this paper covers three villages in Peninsular India (one in Andhra Pradesh and two in Maharashtra) and spans a ten year period from 1975 to 1984. It should be noted at the beginning that the coverage of the main analysis of this paper is limited both temporally and geographically. To minimize the temporal limitation, recent developments in the survey villages are also discussed.

The paper is organized as follows. We give in Section 2 a brief overview of the dynamics of rural consumption in India both at the macro level and in the ICRISAT villages. We also

[1] See Drèze and Sen (1995) among others for these aspects of socio-economic development.

[2] A more disaggregated, more multilateral approach in this paper is deeply influenced by the entitlement and capability approach by Sen (1980, 1985).

describe the ICRISAT household data set in this section. Then in Section 3, we quantify the relationship between the consumption dynamics and the initial characteristics of households. We discuss implications of these econometric results further in Section 4, where we introduce recent changes in the study villages, supplemented by the author's own observations in 1999. In Section 5, we summarize the findings of the paper.

2 Dynamics of Rural Consumption

2.1 ICRISAT Household Data

Semi-arid tropics, defined as those tropical regions where annual rainfall ranges from 400 to 1,200mm, occupy the majority of India's area (Walker and Ryan, 1990). Without perennial irrigation, semi-arid agriculture is inherently dependent on monsoon and frequently suffers from droughts. The lack of dependable irrigation has resulted in a slow spread of green revolution technology for rice and wheat. The improvement of well-being of the people living in the semi-arid tropics, therefore, is critically important from economic development perspective.

With this background, the ICRISAT, located in the center of India's semi-arid tropics in the suburban area of Hyderabad, has implemented both intensive and extensive household surveys to collect socio-economic information at the micro level. These surveys are known as Village Level Studies (VLS) and famous for its detailed information on agricultural production as well as rural consumption (Walker and Ryan, 1990).

Among the VLS data, those for three villages of Aurepalle (Andhra Pradesh), Shirapur (Maharashtra), and Kanzara (Maharashtra) are especially famous for development economists, because they were surveyed continuously. Microeconomic data with both cross section and time series dimensions are called "panel" or "longitudinal." Although panel data are very informative, they are hardly available for developing countries, including India (Lanjouw, 1997). The rare exception to this rule is the ICRISAT-VLS panel data, which has been used extensively in the recent literature on microeconometric analysis of development.[3] Among the topics investigated, the question how rural households cope with production risk has been analyzed most intensively. Among a number of important studies, Townsend's (1994) investigation was a seminal one, demonstrating that consumption of

[3]See Kurosaki (1996). Its English version with latest additions is under preparation.

the sample households was insulated from fluctuations in income much better than initially expected but the hypothesis of efficient risk sharing was rejected in many cases. Kurosaki (1999) re-investigates this issue with an extended model that generalizes Townsend's model.

The main data set used in this paper is, therefore, composed of household panel data spanning the ten-year period from 1975 (cropping year 1975/76) to 1984 (cropping year 1984/85), collected from the three villages. Forty households (ten each from farming categories of landless, small farms, medium farms, and large farms) were surveyed each year. Due to attrition and household division, the complete panel data set of ten years is composed of 35 households in Aurepalle, 33 in Shirapur, and 36 in Kanzara.

Village characteristics are summarized in Table 1 and their details are available from Walker and Ryan (1990, Chap.3). Aurepalle and Shirapur are drier than Kanzara. Not only the rainfall in these two villages is low on average, its annual fluctuation is high. Although both villages were basically rain-fed when the VLS was implemented,[4] cropping patterns were very different due to differences in soil quality. In Aurepalle, where red soil (low moisture retention capacity) dominates, the main cropping season is *kharif* (monsoon season) when bajra (pearl millet), jowar (sorghum), and castor are cultivated on rain-fed lands and paddy is cropped on irrigated lands. In Shirapur, where black soil (high moisture retention capacity) dominates, the main cropping season in the VLS period was *rabi* (post-monsoon season) with jowar as the dominant crop. In Kanzara, where rainfall is more assured on black soil, major crops are cotton, pulses, and jowar in *kharif*. On average, income per capita during the survey period was higher in Kanzara than in the other two villages (Table 2). This is mostly due to sustained technical changes in dryland agriculture, represented by the introduction of modern varieties of cotton and jowar.

In all the three villages, social classification according to castes is possible although their ranking is not the same as economic prosperity ranking at the individual household level. During the survey period, caste rigidities were the strongest in Aurepalle (Walker and Ryan, 1990, pp.27-28), where the dominant farming caste is Reddy, although the share of land owned by Gowda (Toddy tappers), the most populous community, was increasing. Shirapur is a village dominated by Marathas both in population and in landholding. Two farming castes of Mali and Maratha are both numerous in Kanzara. In this village, the number of Neo-Buddhists influenced by Dr. Ambedkar's social movement is also large and constitutes the third influential group.

[4]See Section 4 for recent changes.

2.2 Dynamics of Rural Income and Consumption

As one of the most important variables that determine rural welfare, village average consumption is plotted in Figure 1, together with village average income, state average consumption, and national average income. All variables are expressed as index based on real values and in per capita terms.[5] Village averages of per capita income and consumption are reported in Table 2.

Several interesting features can be found from the graph, regarding the dynamics of income and consumption. First, both real income and real consumption experienced a gradual increase during the period. Second, in sharp contrast to the smooth increase in income and consumption at the aggregate level (national or state), annual fluctuation is large at the village level. Third, at the village level, income and consumption did not move together.

Table 3 quantitatively confirms these observations. In all the three villages, village average income and consumption increased at an annual rate of 1.4 to 3.5%. However, due to fluctuations approximated by a coefficient of variation of 10 to 18%, none of these growth rates is statistically significant. In contrast, at the national level, the annual growth rate of income per capita is 1.5% and it is statistically significant, because village level shocks were cancelled each other through aggregation over the diverse country.

A similar thing happens at the household level. Incomes of individual households in the same village do not move together. They are prone to shocks which are specific to individual households, or "idiosyncratic" shocks, such as plot-specific crop losses and injury/disease of households' working members. Aggregation at the village level conceals such heterogeneity.

Figure 2 shows the dynamics of household level income and consumption by plotting the ratio of each household's income (or consumption) to the village average in each year. Since plotting all the continuous households makes the graph too messy, data are shown selectively. If each household's income or consumption perfectly co-moves with the village average, the graph should show parallel horizontal lines with different intervals depending on their average income level. However, the pattern shown is different from the one with parallel horizontal lines in several aspects.

[5]State and national figures are based on per population without weighting, whereas village figures are based on per adult-equivalent-unit population. Adult equivalent units used in this paper are: 1.0 for adult male, 0.9 for adult female, and 0.52 for children up to 12 years old.

First, the plotted curve for each household's income position moves up and down very frequently, suggesting the importance of idiosyncratic income shocks. Second, the plotted curve for each household's consumption position is much smoother than income curves (compare the upper and lower figures). This suggests that consumption smoothing through implicit risk sharing[6] takes place within a village .

Table 4 quantitatively confirms these observations. The variability of individual income and consumption positions relative to the village average each year is higher for income than for consumption. This finding is in sharp contrast to what aggregate measures show. As shown in Figure 1 and Table 3, the variability of village average income over time is substantially larger than that of village average consumption only in Shirapur. They are in the similar order in the other two villages. Therefore, the village could be treated as the basic unit for consumption smoothing at the household level.

3 Consumption Smoothing and Rural Asset Structure

In this section,[7] we formally quantify the above findings. In that process, we attempt to relate the consumption dynamics of individual households with their social and economic positions. In other words, we would like to find who enjoy more consumption growth than the village average growth, who are more able to bear common risk, and who are less vulnerable to idiosyncratic shocks. In the Indian context, land, caste, and education are natural candidates for factors determining these relations.

3.1 Estimation Model

We estimate a regression model for intertemporal consumption change of household h in the following way:

$$\Delta \ln c_{it} = b_i + a_i \Delta \bar{\ln} c_t + \zeta_i \Delta \ln y_{it} + u_{it}, \tag{1}$$

where Δ is a time difference operator, c_{it} is real consumption per capita of household h in year t (see Table 2), $\bar{\ln} c_t$ is the village average of the natural logarithm of c_{it}, y_{it} is real

[6]By "implicit risk sharing," we imply not only an informal arrangement of risk sharing(Townsend, 1994; Kurosaki, 1999), but also informal credit with state-contingent elements (Udry, 1994).

[7]This section is extracted from Kurosaki (1999). See Kurosaki (1999) for details of theoretical models and econometric results.

income per capita (see Table 2), u_{it} is a disturbance term with zero mean, and b_i, a_i, and ζ_i are parameters to be estimated. The left hand side expression approximates the growth rate of household consumption. $\Delta \ln \bar{c}_t$ controls for shocks common to all the villagers. $\Delta \ln y_{it}$ represents idiosyncratic income shocks to each household.

Our concern is how parameters (b_i, a_i, ζ_i) vary across households. If b_i is more positive, it implies that household i enjoys more consumption later. If a_i is larger than one, it implies that household i's consumption responds more to the village aggregate shock.[8] If ζ_i is more positive, it implies that household i is more vulnerable to idiosyncratic income shocks. These are empirically testable hypotheses.

Kurosaki (1999) estimates equation (1) for each household but such an estimation suffers from a low degree of freedom because we have only ten years for each household. Therefore, in this paper, a more structurally restricted version in Kurosaki (1999), i.e.,

$$\Delta \ln c_{it} = (b_0 + Z_i b_1) + (a_0 + Z_i a_1)\Delta \ln \bar{c}_t + (\zeta_0 + Z_i \zeta_1)\Delta \ln y_{it} + u_{it}, \tag{2}$$

is estimated, where Z_i is a factor that affects consumption dynamics.

Ideally, Z_i should include a variable representing social positions of a household but not affected by endogenous household decisions. By "social positions," we mean inherent characteristics of households that determine preferences toward consumption. However, one fundamental question is that most of the proxies for the social positions, such as wealth, education, and demographic structure are endogenous to household economic decisions in the long run. We partially reduce this problem by taking the initial values of these variables. Furthermore, we include in the empirical model a variable for caste ranking, which could be safely treated as exogenous. Nevertheless, the fundamental problem of endogeneity should be taken care of in interpreting the empirical results below.

Five shifters, which are all related with households' initial characteristics, are tried for Z_i: a dummy variable for ownership of agricultural land in 1975 (LANDD), its value per capita (LANDPC), education status of the household head (SCHOOL), demographic characteristics approximated by the share of children in household size (CHILDR), and caste rank (JGRRANK) (see Table 2). The marginal effect of land for owners is represented by LANDPC and its threshold effect for a landless to become a landed household is represented by LANDD. In rural India, land ownership, education, and high caste ranking are all a typ-

[8] Kurosaki (1999) shows theoretically that higher b_i corresponds to less myopic time preferences and higher a_i corresponds to less risk-averse preferences.

ical signal for a high social position. On the other hand, the demographic variable could represent other aspects that directly affect households' preferences.

Based on equation (2), the testable hypotheses above are now changed into tests for the significance of b_1, a_1, and ζ_1. If they are statistically significant, it implies that such a shifter Z_i is structurally related with the difference in consumption dynamics among households.

3.2 Estimation Results

Table 5 shows estimation results when all the three villages are pooled. Since the quality of some data for the first year and the last three years is not as high as that for other years (Walker and Ryan, 1990, p.67), regression results for the 1976-81 period are also reported. In Table 6, summary results are presented for each village.

These results show that, first, none of these shifters are significant in affecting b_i. It implies no support for the heterogeneity in deterministic consumption growth rates once common and idiosyncratic shocks are controlled for.

Second, land variables significantly increases a_i and significantly decreases ζ_i in many cases. It is shown further that, among the landed class, more landholding (i.e., higher LANDPC) implies less risk aversion and more insulation from income shocks.

Third, although education, land variables, and caste are correlated,[9] their effects are not the same. For example, in Shirapur, SCHOOL has the opposite sign of LANDD in shifting parameter ζ_i. The significance of the relationship for land variables and that for caste varies a lot from village to village. The correlation among landholding, education, and caste ranking exists but not to the extent that the three can be regarded as equivalent.

Fourth, village-by-village estimation results (Table 6) show an interesting contrast regarding the non-significant variables among the four correlated shifters of LANDD, LANDPC, SCHOOL, and JGRRANK. In Shirapur, caste effects are nil. In Kanzara, caste and education effects are nil and land effects are weak. These patterns seem consistent with the contrast among the villages with respect to social and economic development. In Aurepalle, where both land and caste variables are important determinants of consumption smoothing, cooperative credit schemes were less active, private moneylending was more important, and caste restriction was observed in the strongest way (Walker and Ryan, 1990, pp.27-28,

[9]From our data set, correlation coefficients between LANDPC and other four variables are: LANDD= 0.418 ***, CHILDR=0.0531, JGRRANK=-0.503 ***, and SCHOOL=0.588 *** (all three villages pooled), where *** shows that the coefficient is statistically significant at 1%.

pp.199-200). Education was most widely spread in Kanzara and most unequally diffused in Aurepalle (Table 2).

These findings are robustly supported in other specifications such as level change regressions instead of log changes, or, the use of alternative common shock measures. See Kurosaki (1999) for details.

4 Sample Villages after 1985

4.1 Major Changes in the Sample Villages since 1985

The quantitative analysis in the previous section covers only a limited period of 1975-84. Rural India has been changing rapidly since then, especially since the introduction of the Economic Reforms in 1991. Although the ICRISAT officially terminated data collection from the three villages after 1985, sporadic resurveys have been conducted (Rao, various issues). The author also visited the three villages in August 1999. From these sources, major developments could be summarized as follows.

First, irrigation has expanded in all the villages but especially in the drier villages of Aurepalle and Shirapur. In Aurepalle, the number of tubewell owners has increased, resulting in more land now under paddy cultivation. However, here the change is still marginal because paddy cultivation in *kharif* was a part of dominant cropping patterns in the VLS survey period (see Table 1). In contrast, irrigation development in Shirapur has been the most phenomenal. Since 1993, the village has been provided with water through a perennial canal network built by the government. Cash crop cultivation during *kharif*, such as sugarcane, cotton, and other horticultural crops, is now a rule rather than an exception. In all the three villages, traditional rain-fed agriculture with extensive intercropping is gradually declining.

Second, all the three villages have now experienced more farm labor shortage than before, mainly due to increased non-farm employment opportunities and increased labor demand from irrigated agriculture. One way to cope with this labor shortage is the increase of tractors. Tractors are not only used for cultivation but for transportation also. Tractor owners are able to utilize the machinery to the full extent through service rental markets.

Third, due to enhanced level of average income and more connection with surrounding grain markets, the sample households have now very few problems in food security. As long as households have labor to sell, they are able to purchase staple food from the market.

Therefore, the core of consumption smoothing has shifted from minimal staple food to other consumption items.

Fourth, economic and social infrastructure has expanded since the VLS period. Now all the three villages have banking facilities, cooperative credit institutions, education facilities, and basic health facilities. In that sense, the disparity observed during the VLS period, especially the superiority of Kanzara has been disappearing.

These developments could be summarized by gradual improvement in the average well-being, which is also supported more or less by a survey of longitudinal village studies in India by Lanjouw (1997). Figure 4 plots income and consumption dynamics at aggregate level (national and state levels). It is shown that until the late 1980s, both national income and state rural consumption were increasing steadily. The steady increase in real rural consumption in Andhra Pradesh and Maharashtra was associated with a steady decline in poverty incidence in these rural areas. Since then, however, divergence between national income and rural consumption has been substantial. National income continued to grew whereas rural consumption in the two states was stagnant. It can be inferred from this figure that the major beneficiaries of the Economic Reforms since 1991 are not those rural dwellers investigated in this paper.

4.2 Implications of Estimation Results

What are then the implications of estimation results in Section 3 to these changes in rural Peninsular India? The econometric results for the ICRISAT households are consistent with an interpretation that risk is shared among villagers in a way more wealthy households serve as an implicit insurance provider. Since these households are less vulnerable to idiosyncratic income shocks thanks to their accumulated wealth, they are able to bear more of common consumption shocks in the village.

This pattern of resource allocation is efficient in the short run. But at the same time, it implicitly implies that more landed households are likely to extract more on average from less wealthy villagers in exchange for the insurance service. This extraction may reduce the possibility for disadvantaged households to enhance income generating capacity in the long run.

The resource allocation found in the econometric results may not be efficient in the long run from another reason also. Although we expect substantial heterogeneity in time prefer-

ences among villagers,[10] we cannot find evidence in support of heterogeneity of parameter b_i.

The inadequacy in intertemporal resource allocation in the long run is likely to lead to an increased inequality in asset accumulation, as was modeled by Zimmerman (1993). When the rural economy enters into a period of rapid and dynamic transformation, the inadequacy might imply more isolation of the poor from economic growth. Spread of tractors and opulence of a few villagers observed today seem to offer partial evidence for this implication.

At the same time, more assured food security at the household level is clearly a good sign for a less wealthy section of the village community. Townsend (1994), who investigated a consumption dynamics of the ICRISAT households based on a simplified model of this paper, carried out separate regression for grain consumption only. He found that grain consumption was smoother than total consumption expenditure but still it was affected by idiosyncratic shocks. Recent developments indicate that welfare costs due to the vulnerability of grain consumption to crop shocks have been reduced.

Another sign for welcome is the development of institutional finance institutions and the spread of education in Aurepalle. This might have blurred the contrast found in the three villages based on 1975-84 data with respect to effects of land and education on consumption smoothing parameters.

5 Conclusion

In this paper, the dynamics of individual consumption is investigated as one of the most important determinants of the quality of rural life in India. The investigation is based on a household panel data set collected during the period from 1975 to 1984 from three villages in Peninsular India.

Estimation results show that the sample households as a whole witnessed gradual improvement in real consumption per capita although it fluctuated substantially across households. The fluctuation is decomposed into shocks common to all the villagers and idiosyncratic shocks. Decomposition results demonstrate that households with higher socioeconomic positions are less vulnerable to idiosyncratic shocks and more willing to bear common risk. Especially, household characteristics represented by land ownership is found to be

[10] See Pender (1996) for experimental evidence for this.

related with consumption smoothing parameters in the most significant way.

We give an interpretation that this pattern of resource allocation could be understood as an implicit risk sharing, in which more landed households bear more of the common shock in exchange for higher payment on average than less landed, more risk-averse households do. At the same time, the estimation results do not show a transfer from the more landed to the less landed in the immediate period in exchange for return transfer in the later period, although it is more likely that the less landed are more myopic than the more landed. Furthermore, vulnerability of less wealthy people to idiosyncratic risk implies that they may need to diversify risk *ex ante* more than more wealthy villagers do. In other words, the observed resource allocation is not effective in achieving the full production potential of less wealthy villagers in the long run. When the rural economy enters into a period of rapid and dynamic transformation, this setting could lead to more inequality and more isolation of the poor from economic growth. Recent developments in the study villages partially support the relevance of this implication.

It is left for further study to investigate whether or not these interpretations are robustly found and supported in other areas in India and other periods. It should be stressed that the coverage of the main analysis of this paper is limited both temporally and geographically. To distinguish the effects of land, education, and caste ranking in more detail is another area of further research. In this paper, we find that the three are not equivalent but cannot differentiate each effect due to multicollinearity among the three. It is also worthwhile to incorporate the endogeneity of these variables in the long run in the empirical analysis.

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Table 1: Characteristics of the Sample Villages

	Aurepalle	Shirapur	Kanzara
State	Andhra Pradesh	Maharashtra	Maharashtra
District	Mahbubnagar	Sholapur	Akola
Rainfall pattern	Unassured, esp. in sowing time	Unassured	Assured
Irrigation	Several dug wells and tanks	Some dug wells	Limited irrigation
Soil	Red soil, heterogeneous	Black soil, heterogeneous	Black soil, homogeneous
Change in agricultural technology	Neglect of dryland agriculture	Technologically stagnant	Sustained change in dryland agriculture
Major crops	Paddy, castor, kharif jowar	Rabi jowar	Cotton, mung bean, hybrid jowar
Populous castes[1]	Gowda (Toddy tappers), Madiga (shoe making), Mala (laborers), Reddy (farming)	Maratha (farming), Dhangar (shepherds)	Mali (farming), Maratha (farming), Mahar [Budh] (laborers)

Source: Prepared from information in Walker and Ryan (1990) and several working papers prepared at the ICRISAT.

Notes: 1) "Populous castes" are shown by the order of the number households in 1975 village census, with traditional occupation in parentheses.

2) All the information corresponds to the initial situation during the sample period of 1975-84.

Table 2: Definition and Summary Statistics of Empirical Variables

		Aurepalle		Shirapur		Kanzara	
c_{it}	Real household consumption expenditure per capita[1] (1983 Rs.)	935	(596)[2]	1176	(494)	1217	(553)
y_{it}	Real household income (a sum of income from crop, labor, and other self-employed activities) per capita[1] (1983 Rs.)	1473	(1446)	1277	(880)	1727	(1344)
Z_i	Proxy variables for households' social positions:						
LANDD	A dummy variable for ownership of agricultural land in 1975	0.743	(0.443)	0.788	(0.415)	0.833	(0.378)
LANDPC	The value of owned agricultural land in 1975 per capita	0.266	(0.385)	0.336	(0.364)	0.412	(0.498)
CHILDR	The share of children in household size[1] in 1975	0.287	(0.131)	0.292	(0.145)	0.288	(0.166)
SCHOOL	Education status of the household head in years of complete education	1.600	(2.558)	2.030	(2.756)	3.861	(4.008)
JGRRANK	Caste rank index compiled by J. G. Ryan with 1 for the socially highest castes and 4 for the lowest ones	2.771	(1.190)	2.000	(1.199)	2.278	(1.031)

Notes: 1) When calculating household size, adult equivalent units are used.

2) Mean values are reported in this table with standard deviations indicated in parentheses.

3) The number of continuous households (N) is 35 (Aurepalle), 33 (Shirapur), and 36 (Aurepalle). The number of observations is (N x 10 years) for c_{it} and y_{it}, and N for Z_i.

Table 3: Growth Rates and Stability of Aggregate Income and Consumption, 1975-84

	Aurepalle		Shirapur		Kanzara		National
	y_t	c_t	y_t	c_t	y_t	c_t	y_t
Annual growth rate	0.024	0.035	0.015	0.018	0.014	0.020	0.015
t-stats	1.372	1.728	0.941	1.639	1.126	1.609	4.303*
Variability	0.160	0.182	0.145	0.099	0.114	0.112	0.032

Source: The author's calculation. See Figure 1 for data sources.

Notes: 1) Estimated equation is $\ln y_t = a_0 + a_1 t + \epsilon_t$ where y_t is the average income per capita and $\ln c_t = a_0 + a_1 t + \epsilon_t$ where c_t is the average consumption per capita.

2) The coefficient estimate $\hat{a}_1$ is reported in the table as "Annual growth rate."

3) The standard error of regression is reported in the table as "Variability" because it approximates the coefficient of variation around the trend.

4) "*" indicates that the coefficient is statistically significant at 1% level. All the other coefficients are not significant at 10% level.

Table 4: Variability of Individual Income and Consumption around Village Average, 1975-84

	Aurepalle		Shirapur		Kanzara	
	y_t	c_t	y_t	c_t	y_t	c_t
Standard deviation	0.998	0.570	0.649	0.410	0.797	0.471
Minimum	0.002	0.009	0.002	0.007	0.002	0.005
Maximum	8.561	5.300	4.608	2.808	5.939	3.300

Source: The author's calculation. See Figure 2 for data sources.

Table 5: Estimation Results

All three villages pooled (NOB=936), 1975-84

	LANDD		LANDPC		CHILDR		SCHOOL		JGRRANK	
b_0	-0.021		-0.011		-0.041		-0.012		-0.020	
	(0.76)		(0.66)		(1.46)		(0.77)		(0.72)	
b_1	0.011		-0.007		0.103		0.000		0.004	
	(0.36)		(0.23)		(1.20)		(0.08)		(0.33)	
a_0	0.417	***	0.392	***	0.578	***	0.483	***	0.672	***
	(2.73)		(4.34)		(3.60)		(5.48)		(4.30)	
a_1	0.170		0.534	***	-0.055		0.032		-0.052	
	(0.99)		(3.02)		(0.11)		(1.39)		(0.88)	
ζ_0	0.308	***	0.188	***	0.115	***	0.178	***	-0.009	
	(4.46)		(6.46)		(2.84)		(6.27)		(0.25)	
ζ_1	-0.229	***	-0.217	***	-0.079		-0.026	***	0.056	***
	(3.20)		(4.14)		(0.59)		(3.79)		(3.45)	
R^2	0.110		0.121		0.101		0.114		0.111	
$\bar{R}^2$	0.105		0.116		0.097		0.109		0.107	
F test	3.499	**	7.473	***	0.604		4.965	***	4.054	***

All three villages pooled (NOB=520), 1976-81

	LANDD		LANDPC		CHILDR		SCHOOL		JGRRANK	
b_0	-0.013		0.019		-0.021		0.009		-0.014	
	(0.40)		(1.01)		(0.62)		(0.46)		(0.41)	
b_1	0.020		-0.044		0.083		-0.002		0.008	
	(0.54)		(1.24)		(0.81)		(0.38)		(0.60)	
a_0	0.114		0.148		0.376	*	0.317	***	0.711	***
	(0.57)		(1.27)		(1.80)		(2.73)		(3.36)	
a_1	0.445	**	0.979	***	0.303		0.054	*	-0.115	
	(1.97)		(4.41)		(0.47)		(1.91)		(1.44)	
ζ_0	0.333	***	0.142	***	0.097	**	0.177	***	-0.053	
	(4.15)		(4.44)		(2.10)		(5.45)		(1.42)	
ζ_1	-0.287	***	-0.186	***	-0.114		-0.034	***	0.069	***
	(3.47)		(3.18)		(0.80)		(4.37)		(3.70)	
R^2	0.093		0.113		0.067		0.102		0.092	
$\bar{R}^2$	0.084		0.105		0.058		0.093		0.083	
F test	5.333	***	9.420	***	0.520		7.136	***	5.193	***

Source: The author's calculation.

Notes: 1) "F test" gives F(3, 930) or F(3, 514) statistics for testing the joint hypothesis that $b_1 = a_1 = \zeta_1 = 0$.

2) Significant at 1% = ***, 5% = **, and 10% = * (2-sided test for t statistics whose absolute value is shown in parentheses).

Table 6: Summary Estimation Results for Individual Villages

Aurepalle

1975-84 (NOB=315)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	n.s.	n.s.	n.s.	n.s.
a_1	n.s.	++	n.s.	n.s.	-
ζ_1	-	- - -	+++	- - -	+++
F test	n.s.	***	**	***	***

1976-81 (NOB=175)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	-	n.s.	n.s.	n.s.
a_1	n.s.	+++	n.s.	+	- - -
ζ_1	- - -	- - -	n.s.	- - -	+++
F test	**	***	n.s.	***	***

Shirapur

1975-84 (NOB=297)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	n.s.	n.s.	n.s.	n.s.
a_1	++	+++	n.s.	n.s.	n.s.
ζ_1	- - -	n.s.	- - -	n.s.	n.s.
F test	***	*	***	n.s.	n.s.

1976-81 (NOB=165)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	n.s.	n.s.	n.s.	n.s.
a_1	+++	+++	+	n.s.	n.s.
ζ_1	-	n.s.	-	- -	n.s.
F test	***	***	*	n.s.	n.s.

Kanzara

1975-84 (NOB=324)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	n.s.	n.s.	n.s.	n.s.
a_1	n.s.	n.s.	n.s.	n.s.	n.s.
ζ_1	n.s.	n.s.	n.s.	n.s.	n.s.
F test	n.s.	n.s.	n.s.	n.s.	n.s.

1976-81 (NOB=180)

	LANDD	LANDPC	CHILDR	SCHOOL	JGRRANK
b_1	n.s.	n.s.	n.s.	n.s.	n.s.
a_1	n.s.	++	n.s.	n.s.	n.s.
ζ_1	n.s.	n.s.	n.s.	n.s.	n.s.
F test	n.s.	n.s.	n.s.	n.s.	n.s.

Source: The author's calculation. See Kurosaki (1999) for full results.

Notes: "n.s."=statistically non-significant; "+++" significant at 1% with positive coefficient; "++" at 5%, "+" at 10%; and "- - -" significant at 1% with negative coefficient; "- -" at 5%, "-" at 10%. Significant at 1% = ***, 5% = **, and 10% = * (F-test).

Notes and Sources of Figures

Figure 1: Dynamics of Aggregate Income and Consumption

Source: Prepared by the author. Original sources are the ICRISAT data for village information, Government of India (1999) for all India's income data using "per capita net national product at constant factor cost," and World Bank (1997, p.53, p.61) for state consumption data using "NSS rural mean consumption per capita" at October 1973-June 1974 prices.

Figure 2: Dynamics of Household Income and Consumption

Source: Prepared by the author using the ICRISAT data.

Figure 3: Dynamics of Income, Consumption, and Poverty Incidence, 1973-93

Source: Prepared by the author. Original sources are Government of India (1999) for all India's income data using "per capita net national product at constant factor cost" and World Bank (1997, p.53, p.61) for state consumption and poverty index data based on "NSS rural mean consumption per capita" at October 1973-June 1974 prices.