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TRACKING POVERTY
THROUGH PANEL DATA:
RURAL POVERTY IN INDIA
1970-1998

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Tracking Poverty through Panel Data: Rural Poverty in India 1970-1998

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1. Introduction

The distinction between transitory and chronic poverty has been highlighted in the research conducted by the Chronic Poverty Research Centre (see www.chronicpoverty.org). While estimates of the incidence of poverty obtained from sample based studies provide insights into the prevalence of poverty and its severity at a point of time, estimates of persistence of poverty need to be examined through use of a panel data set. In this paper we report some of the findings from analysis of extension of the earlier two-wave panel data set for the years 1970-71 and 1981-82 to a third wave for 1998-99. We therefore have three points at which data was collected for the same households, i.e., the years 1970-71, 1981-82 and 1998-99.

The question of how persistent is poverty is important, because policies to alleviate transitory poverty may not be effective in addressing chronic or persistent poverty. Persistence of poverty suggests that there is failure of the economic system in integrating different sections of society in the growth process. The purpose of this paper is descriptive. We examine the extent of persistence of poverty in rural India based on the 3 surveys conducted by NCAER to track the same households over the period from 1970-71 and 1998-99.

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The paper estimates poverty on the basis of data on per capita consumer expenditure by the households. A household is classified as 'poor' if the per capita consumption expenditure of the household for the year is below the 'poverty line'.

We have used the poverty line defined by the expert group of the Planning Commission for the classification of the households.

2. The Surveys

The three surveys, on which this analysis is based, were conducted by NCAER in 1970-71, 1981-82 and 1998-99. Each of these surveys covered rural households only. The sample households were spread over about 250 villages in 15 major states. The 1970-71 survey was part of a repeat survey conducted in the two preceding years. The sample households in each of the three survey rounds, viz. 1970-71, 1981-82 and 1998-99, included a common set of households. In other words, while the initial sample was probabilistic, the subsequent surveys attempted to track the same households surveyed in the previous round. The initial selection of the sample in the 1968 survey was based on a probabilistic design. Districts in each state were stratified and then the sample villages were selected based on population. From each sample village, households were selected after stratification. For the analysis in this paper only the data for 'panel households' was available.²

Because of the long time-gap between the surveys some of the households that were surveyed in 1970-71 could not be traced in 1981-82. The households that are considered to be part of the panel have following features:

1. The head of the household in 1970-71 was alive (in 1981-82) and the household was intact;
2. The head of the household was alive, but all the members of the household had not stayed together; and
3. The head of the household in 1970-71 was dead (in 1981-82) but rest of the household was intact.

Thus, not all splits in the household were followed in the second wave of the survey. The number of households that formed the panel

² The surveys were conducted such that information was collected for the previous year. Thus, the information for 1970-71 was collected in late 1971 or in 1972. The survey years do not refer to calendar years but 'agricultural years', normally the period July-June.

for the two rounds of data was 3,139 from 250 villages. The third round of the survey covered all the households that were surveyed in 1981 and their splits if the household continued to reside in the village. In the final analysis, the sample available has 3,936 households that were surveyed in 1998-99 and could be traced to the 1981-82 sample or parts of the households of 1981-82 sample. The 1981-82 sample itself was traced to 1970-71 sample. The survey tracked only the male line of the households. In other words, when the households were identified in the subsequent surveys, only those households headed by the same head of household or the sons (or daughters in law) of the head of the household of the previous survey were tracked.

Analysis of the first two waves of the NCAER panel data (i.e., 1970-71 and 1981-82) covering 3,139 households was reported in Bhide and Mehta (2004a and b). This paper extends the earlier analysis to include data from a third wave based on the 1998-99 survey. The two sets of analysis are not strictly comparable because instead of 3,139 households used in Mehta and Bhide (2003) and Bhide and Mehta (2004a and b) we now have 3,996 households in the panel. One important feature of the 1998-99 survey is that a large number of household splits were recorded, unlike in the previous round. In the previous round, only one of the splits (if any) was followed from the originally surveyed household. There was, thus, one-to-one correspondence between the 1970-71 and 1981-82 sample households. In 1998-99, households that were 'tracked' from the previous round were only 2,498. However, for each of the 2,498 households for which data was collected in 1981-82, there were one or more households in 1998-99.

After including the splits whose lineage could be traced to 1981 households, the total 'panel' for 1970-71 to 1998-99 numbered 3,996 households. To construct a balanced sample, we replicated the household data for the two rounds conducted earlier (i.e., 1970-71 and 1981-82) to match the households in 1998-99. For example, if a household that was surveyed in 1981-82 is now split into two households in 1998-99, then we replicated all the data for this household in 1981-82 and 1970-71 to correspond to the two households in 1998-99. If a poor household in 1981-82 splits into two in 1998-99, one of which is poor and one non-poor, then in the panel, we have two poor households in 1981-82 (in place of original one) and correspondingly also two households in 1970-71.

This is clearly a different approach from the one where individuals are tracked in longitudinal studies. The latter approach is not possible as such information has not been retained for each member of the household across the surveys.

The surveys provide a variety of information on household characteristics. This information is valuable in understanding correlates of poverty and dynamics of poverty. In Bhide and Mehta (2004) we provided an analysis of these correlates based on the previous two rounds of data. In this paper we examine the evidence using the more recent data. The analysis uses 'unweighted' data.

3. Persistence and Transition in Poverty Status in Rural India

The sample considered here comprises households that were tracked in the three rounds of the surveys. As noted earlier, for the purpose of analysis, the households surveyed in the previous rounds were replicated to match the splits in 1998-99. Thus, if a household surveyed in 1981-82 had split into four households in 1998-99, this household was replicated as four different households in 1981-82 and also in 1970-71. The impact of this replication is that if the new 'split' corresponds to a 'poor' household in 1981-82 then we would be 'creating' four poor households in 1981-82 rather than just one original one. The same would be true if the 1981-82 household happens to be non-poor. On the other hand, if we aggregate the information in 1998-99 for all the splits corresponding to a household of 1981-82, then we would be creating an 'average household' in 1998-99, which may not reflect the actual conditions prevailing in 1998-99. Moreover, our main focus in this analysis is to track the dynamics rather than provide estimates for a given year and hence we have adopted the method of replicating the earlier data rather than aggregating the recently collected data. To get some idea of the consequences of this procedure we have examined the differences in the patterns of data with respect to using the replicated data (1970-71 and 1981-82) as against using non-replicated data (1970-71 and 1981-82) and these results are noted in the discussion below.

We first examine the distribution of the sample households across different types of poverty status. In other words, how many households move out of poverty or stay in poverty over time? The tracking of the 'same' households in the surveys allows us to quantify the patterns.

The classification scheme that we follow is:

- a. In the case of two period comparisons, representing the status of a poor household in a survey as P and non-poor status as NP,

- P_P: poor in round 1 of the survey and also in round 2 indicating persistence of poverty or chronic poverty (CP);
 - P_NP or NP_P: poor in round 1 of the survey and non-poor in round 2, or ‘NP’ in round 1 and ‘P’ in round 2, indicating transient poverty (TP);
 - NP_NP: non-poor in both the rounds of the survey.
- b. In the case of three period comparisons, representing the status of poor household in a survey as P and non-poor status as NP,
- P_P_P or P_P_NP or NP_P_P: poor in at least two consecutive rounds of the survey indicating persistence of poverty or chronic poverty (CP);
 - P_NP_P or NP_P_NP: poor in non-consecutive rounds of the survey indicating transient poverty (TP)
 - NP_NP_NP: non-poor in all rounds of the survey.

The results applying the above classification scheme to the panel data are presented in Table 1. Chronic poverty or persistent poverty was greater when we consider the period 1970-71 to 1981-82 than when we consider the period 1981-82 to 1998-99. The incidence of CP in the panel ranged from 25.33 to 28.43 per cent between the years 1970-71 to 1981-82. The estimates differ depending on how we construct the panel, i.e., whether we use versions a, b or c given below.

The period 1970-81a refers to the panel households for 1970-71 and 1981-82 only; the period 1970-81b refers to the sample where the original households were replicated to match the splits in 1998-99. The period 1970-81c refers to the sample where we retain only those households that could be tracked in 1998-99 with or without a household split. The period 1970-98d refers to the sample where we retain only those households that are tracked in all the three rounds without a split.

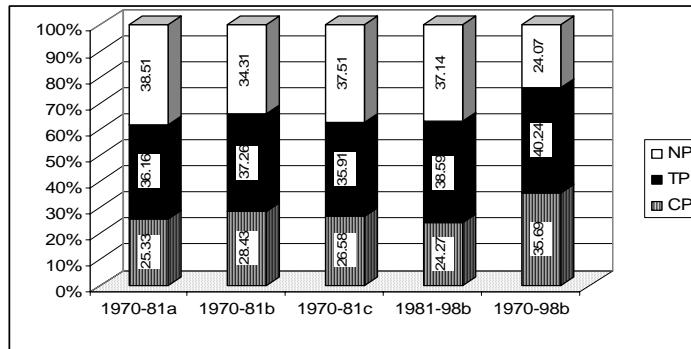
The incidence of chronic poverty is the lowest if we take into account only those households that were common to both 1970-71 and 1981-82 surveys. If we consider only those households that are represented in all the three rounds (either by replicating them to match the households in 1998-99 or without replication) the incidence of CP is greater. In other words a longer duration panel is likely to show slightly greater persistence of poverty. This may also result from the fact that the potential for capturing

CP also increases as we extend the panel and if we define two consecutive poverty episodes as reflecting the occurrence of CP.

The results show that the incidence of CP is indeed greater at 35.69 to 38.25 per cent, when we consider the longer period of 1970-71 to 1998-99.

Households experiencing transient poverty (TP) or those that move into and out of poverty, account for 35 to 40 per cent of the sample panel (Figure 1). The incidence of TP also increases when we consider a longer duration of time. The percentage of households experiencing TP increases to 40 per cent when we consider the period 1970-71 to 1998-99 as compared to about 36 to 38 per cent if we consider the two sub-periods.

Figure 1: Incidence of Poverty by Duration through the Period 1970-1998



Note: The chart does not include the last row of Table 1 which indicates a similar pattern as in the case of 1970-81c.

The percentage of households experiencing poverty in any one round of the survey is high - ranging from 61.5 to 76 per cent depending on the period considered. This does show that the episodes of poverty are quite common, at least in the present sample.

That CP is significant in rural India is clearly brought out by the patterns in Table 1 and Figure 1. The results show that the incidence of CP is indeed greater at 35.69 per cent, when we consider the longer period of 1970-71 to 1998-99.

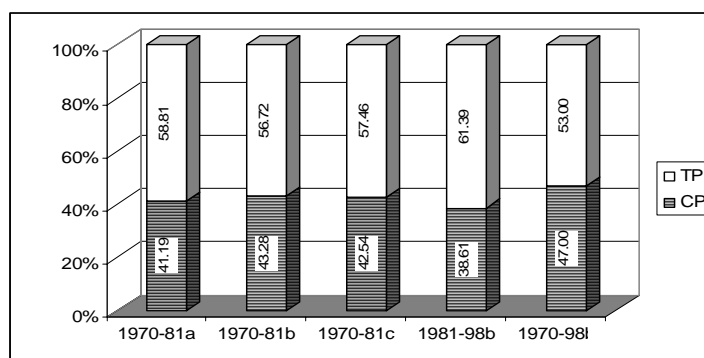
Table 1: Tracking Poverty Duration Status through the Panel Households: 1970-71 to 1998-99

Period	Sample size	Distribution of Sample HHDs%				Distribution of Poor HHDs%			Poor HHDs%
		CP	TP	NP	Total	CP	TP	Total	
1970-81a	3139	25.33	36.16	38.51	100.00	41.19	58.81	100.00	61.49
1970-81b	3996	28.43	37.26	34.31	100.00	43.28	56.72	100.00	65.69
1970-81c	2498	26.58	35.91	37.51	100.00	42.54	57.46	100.00	62.49
1981-98	3996	24.27	38.59	37.14	100.00	38.61	61.39	100.00	62.86
1970-98	3996	35.69	40.24	24.07	100.00	47.00	53.00	100.00	75.93
1970-98d	2315	38.25	40.45	21.30	100.00	48.60	51.40	100.00	78.70

Note: CP= Poor for two or three consecutive periods; TP= Poor in non-consecutive years; NP= non-poor in all three years; Poor= poor in any of the years; The period 1970-81a refers to the panel households for 1970-71 and 1981-82 only; The period 1970-81b refers to the sample where the original households were replicated to match the splits in 1998-99. The period 1970-81c refers to the sample where we retain only those households that could be tracked in 1998-99 with or without a household split. The period 1970-98d refers to the sample where we retain only those households that are tracked in all the three rounds without a split.

Among the poor (defined as poor in any one survey period) the percentage of CP is as high as 38.61 per cent in the most recent panel of 1981-82 to 1998-99. Figure 2 highlights the prevalence of CP in the rural households.

Figure 2: How wide-spread is Chronic Poverty: 1970-71 to 1998-99



The findings so far show that CP is likely to be experienced by a significant proportion of the rural poor. The panel results also suggest that there are movements in and out of poverty as indicated by the larger share of TP among the poor. In the earlier analysis based on the two-period panel data, we found that a number of household characteristics and more ‘macro level’ factors were associated with the dynamics of poverty status. The additional data for one more period provides an opportunity to examine these relationships further.

Analysis of Table 2 and 3 shows that while the incidence of CP (among all households, both poor and non-poor) is high at 28 per cent between the first two waves of the panel data, it remains high but declines to 24 per cent by the third wave. The patterns of poverty status and social groupings (caste/tribe) indicate that CP is the highest for SC households, followed by ST and other castes.

The extent of **Chronic Poverty among all households** between 1970-71 and 1981-82 was:

- 47.73 per cent of all SC households were CP
- 36.36 per cent of all ST households were CP
- 25.4 per cent of all other caste households were CP
- 28.43 per cent of all households were CP

Table 2: Social Classes and Dynamics of Poverty

Caste	Distribution of Sample HHDS%				Distribution of Poor HHDS%		
	CP	TP	NP	Total	CP	TP	Total
Period: 1970-81 Sample: 3996							
SC	47.73	36.36	15.91	100.00	56.76	43.24	100.00
ST	36.36	40.74	22.90	100.00	47.16	52.84	100.00
OC	25.40	37.06	37.54	100.00	40.67	59.33	100.00
Total	28.43	37.26	34.31	100.00	43.28	56.72	100.00
Period: 1981-98 Sample: 3996							
SC	38.64	40.40	20.96	100.00	48.88	51.12	100.00
ST	27.95	44.44	27.61	100.00	38.60	61.40	100.00
OC	22.22	37.84	39.93	100.00	37.00	63.00	100.00
Total	24.27	38.59	37.14	100.00	38.61	61.39	100.00

Note: SC= Scheduled Castes, ST= Scheduled Tribes; OC= Other Castes; CP= Poor in both the periods; TP= Poor in one of the periods, NP= non-poor in both the periods

Table 3: Education Level of Household Head and Dynamics of Poverty

Education 1970	Distribution of Sample HHDS%				Distribution of Poor HHDS%		
	CP	TP	NP	Total	CP	TP	Total
Period: 1970-81 sample 3996							
Illiterate	34.66	36.51	28.82	100.00	48.70	51.30	100.00
Primary education	34.03	46.57	19.40	100.00	42.22	57.78	100.00
Above Primary	14.56	36.21	49.23	100.00	28.69	71.31	100.00
Total	28.43	37.26	34.31	100.00	43.28	56.72	100.00
Period: 1981-98 Sample: 3996							
Illiterate	27.03	50.00	22.97	100.00	35.09	64.91	100.00
Primary education	29.69	38.82	31.50	100.00	43.34	56.66	100.00
Above Primary	16.70	37.25	46.06	100.00	30.95	69.05	100.00
Total	24.27	38.59	37.14	100.00	38.61	61.39	100.00

Note: CP= Poor in both the periods; TP= Poor in one of the periods, NP= non-poor in both the periods

The extent of **Chronic Poverty among all households** between 1981-82 and 1998-99 was:

- 38.64 per cent of all SC households were CP
- 27.95 per cent of all ST households were CP
- 22.2 per cent of all other caste households were CP
- 24.27 per cent of all households were CP

Therefore there was a decline in the incidence of CP among the poor over time. The highest decline for any group was 9.09 per cent over almost three decades from 1970-71 to 1998-99 and was for the SC group.

Among the poor households, the share of Chronically Poor households was:

- 56.8 per cent for the period 1970-81 and declined to 48.9 per cent for the period 1981-98 for SC households.
- 47.16 per cent for the period 1970-81 and declined to 38.6 per cent for the period 1981-98 for ST households.
- 40.67 per cent for the period 1970-81 and declined to 37 per cent for the period 1981-98 for other caste households.
- 43.28 per cent for the period 1970-81 and declined to 38.61 per cent for the period 1981-98 for all households.

It may therefore be reiterated that while a clear decline in chronic poverty was observed for all the three social groups, the extent of decline differed and was not as high as would be expected over a three decade time duration. In no case did the decline exceed 10 per cent over the time period from 1970-71 to 1998-99.

The decline in the proportion of episodes of poverty can also be seen from changes in cases of non-poor status during the two periods of observation. At the aggregate level, 34.31 per cent of households experienced non-poor status between 1970-71 and 1981-82 whereas 37.14 per cent households were non-poor between 1981-82 and 1998-99. This pattern applies to all the three social groups considered. However, the percent of those who were non-poor increased by 5 per cent for SCs and STs and only around 2 per cent for other castes. The third category of households are those that are transiently poor or TP.

We analysed one other household characteristic that is often associated with poverty, viz. education level of head of household. At a general level, in both the periods under consideration, the incidence of both CP and TP declines with an increase in the level of education of the household head.

Also, among the poor households, the share of CP is lower as education level increases in 1970-81. But this pattern is not uniformly so for 1981-98. There are clearly other factors that influence income and consumption levels and hence the relationship between education and poverty may not become apparent unless we account for these factors.

4. Factors that sustain Poverty and those enable exit from Poverty

The income potential of a household improves when the quantum and quality of assets that it possesses improve. The assets are defined to include not only the physical assets but also the quality of human resources. In addition, the income potential of the household is also influenced by the macro variables relating to the larger socio-economic environment of the household. Improvement of household income over time is therefore linked to changes in household assets- physical and other- which in turn is also related to the mobility of the households across occupation groups and across regions. The ability of households to move across occupations and regions is influenced by social barriers and economic constraints that may relate to absence of adequate social networks and information that facilitate mobility. In an interesting analysis of the spatial mobility of the households using the data from the same panel households, Munshi and Rosenzweig (2005) examine the hypothesis that the persistence of low spatial and marital mobility in rural India, despite increased growth rates and rising inequality in recent years, is due to the existence of caste networks that provide mutual insurance to their members. Their analysis shows that households that out-marry (into other caste) or migrate lose the services of these networks. This dampens mobility when alternative sources of insurance or finance of comparable quality are unavailable.

In earlier research based on panel data (Bhide and Mehta 2004) we had examined the correlates of persistence of poverty using the data between 1970-71 and 1981-82. We extend this analysis to examine the relationships between socio-economic variables and poverty status of households with the help of the recent wave of panel data for 1998-99.

In this paper, we limit our analysis to the relationship between the initial conditions of the household and poverty persistence over time. While the dynamic changes in the initial conditions are important, they will be considered at a later stage of the analysis.

The households level variables we focus on are (a) caste: whether a household belongs to SC or ST (b) education level of household (c) family size and its composition, and (d) physical assets: land, house and livestock. The village level variables are (a) infrastructure in the village – an index based on access to roads, phone, school, health facility, village level worker (agricultural extension), post office and market for produce and (b) village size (population). The district level variable is the degree of urbanisation. The variables used in the analysis are defined in Appendix 1.

The framework adopted for analysis is the probit model where the dependent variable is the zero-one variable indicating whether the household remained in poverty (P_P), taking the value zero or whether the household escaped from poverty (P_NP) taking the value of one. A multi-nomial logit may be more appropriate in tracking the income dynamics more fully. However, given the limited scope of this paper, we have limited the framework to a probit model. The results of the analysis for the two periods of data are presented in Table 4. The data used in this analysis refer only to the ‘poor’ in the initial year of the panel.

There are some similarities and some differences in the results between the two time periods that we consider.

Among the social groups, the SC status was an important factor influencing poverty dynamics in the 1970s. However, in the 1980s and 1990s (1981-82 and 1998-99), the SC status was not a significant variable influencing movement out of poverty or its persistence. However, the ST status continued to be a significant factor. Therefore, it is not only the social grouping but also other factors that may indicate access to services or markets, which influence poverty dynamics in the more recent period.

Household size by itself does not influence transition from poverty in either of the two periods considered. However, composition of households in terms of dependents (children) or percentage of females (access to labour market) turn out to be significant factors in influencing transition from poverty during 1981-82 to 1998-99.

**Table 4: Factors Influencing Dynamics of Poverty:
Results of Probit Model**

Initial Conditions	Dependent Variable: P_P=0; P_NP=1			
	P1970-81		P1981-98	
	Coefficient	P> z	Coefficient	P> z
Constant	-1.2829	0.00	-0.3309	0.25
<i>Household Characteristics</i>				
SC	-0.1661	0.03	-0.0548	0.53
ST	-0.4779	0.00	-0.3951	0.00
Children%	-0.0022	0.19	-0.0053	0.00
Females%	0.0015	0.42	-0.0084	0.00
Household size	-0.0081	0.36	-0.0049	0.60
<i>Physical Assets</i>				
Land owned	0.0586	0.00	0.0221	0.07
Irrigation	0.2179	0.00	0.2650	0.00
Own house	0.4996	0.08	0.0462	0.84
Livestock	0.2118	0.00	0.1040	0.23
<i>Macro Variables</i>				
Infrastructure	0.1779	0.00	0.0955	0.00
Village Pop	0.00002	0.19	-0.000003	0.81
Urban%	0.0079	0.00	0.0178	0.00
No. of Observations	2096		1665	
LR Chi-square (12)	260.7		131.7	
Prob>Chi-square	0.0		0.0	
Log Likelihood	-1315.1		-1065.4	
Pseudo R-square	0.09		0.06	

Land is the only asset that turns out to be important in distinguishing between persistence and exit from poverty among the three considered in both the periods, viz. land, livestock and house. While livestock and possession of 'own house' were important in the 1970s, they were not significant in the subsequent period. The variables considered here do not distinguish between the quality of assets possessed in the case of livestock and house. But even with this limitation, these variables were significant in the period 1970-81.

Among the more 'aggregate level' variables, village level infrastructure and the extent of urbanization of the district to which the village belongs turn out to be significant in both the periods. The 'village size' is not a significant variable in either period.

There are, therefore, indications that it may not be the same factor that influences poverty dynamics over time. The influence of some factors may decline and some others increase. While the factors influencing incidence of poverty are fairly well known, the findings with respect to dynamics of poverty - persistence or transition - are not widely examined.

This paper points to the role of some of the more aggregate level variables that are 'external' to the households. These factors may be related to the policy interventions at the local level or to the linkages between the local economy and the larger economy.

For example, the regression results point to the pro-exit impact of village level infrastructure on poverty. The 'infrastructure' variable reflecting the access to a variety of services within the village has a significant impact on inducing exit from poverty. This effect is the same in both the waves of the panel.

'Size' of the village represented by the village population has no significant pro-exit impact on poverty in either of the periods. This may be on account of the fact that adequate employment opportunities are not available even in the large villages. Only if there are jobs at the local level can larger village size be an important factor that influences exit from poverty.

The larger the degree of urbanization in the immediate environment of the villages, as reflected in the percentage of urban population in the district to which the village belongs, lower is the probability of 'persistence of poverty' and the probability of exit from poverty increases. Urbanization can be expected to provide more employment opportunities to supplement the income of the households.

The findings indicate a more complex picture when it comes to explaining the persistence or exit from poverty. While some of the well-known correlates of incidence of poverty are seen to be significant in explaining dynamics of poverty, there is variation in their role over time. Policy interventions at the local level that improve access to infrastructure services seem important in reducing persistence of

poverty and this has emerged from other work on chronic poverty as well (Bhalla 2004).

5. Conclusions

This paper has examined the patterns of movement of rural households across poverty groupings based on a unique panel data set covering a period of three decades. The findings show that there is significant incidence of chronic poverty in rural India. If we consider the two consecutive periods in which the survey was conducted, separately, the incidence of chronic poverty declined from 28.4 per cent of sample households between 1970-71 to 1981-82 to 24.27 per cent of sample households in 1981-82 to 1998-99. Of those who were poor, the percentage of households that were chronically poor, declined from 43.28 to 38.61 per cent over these two sets of time.

However, if we consider a longer time period of three decades, (1970-71 to 1998-99), the percentage of households experiencing chronic poverty increases. Therefore, while the incidence of chronic poverty declined between 1970-71 to 1981-82 and 1981-82 to 1998-99, the extent of reduction, given the three decade time duration, is marginal. Similarly, while a clear decline in poverty was observed for all the three social groups, the extent of decline differed and was not as high as would be expected over a three decade time duration. In no case did the decline exceed 10 per cent over the time period from 1970-71 to 1998-99.

Why do the households continue to be poor over such long periods of time? This paper finds that social barriers such as caste distinction alone have a smaller impact in explaining the dynamics of poverty. The composition of the household is an important determinant of probability of persistence or exit from poverty although absolute size is not. Importantly, the results point to the significant poverty reducing effects of village level infrastructure and greater opportunities for employment at the local level through links to growing urban population.

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APPENDIX 1

Definition of the Variables Used in the Regression Analysis

Variable	Description
SC	Dummy variable (=1 if household is SC, =0 otherwise)
ST	Dummy variable (=1 if household is ST, =0 otherwise)
Children%	Percentage of children (less than 14 years' age) in the household
Females%	Percentage of females in the household
Household size	Number of household members
Land owned	Acres
Irrigation	Dummy variable (=1 if household has access to irrigated land, =0 otherwise)
Own house	Dummy variable (=1 if household has own house, =0 otherwise)
Livestock	Dummy variable (=1 if household has livestock, =0 otherwise)
Infrastructure	Index with value ranging from 1 to 7 (sum of the infrastructure items present in the village)
Village Pop	Population of the village
Urban%	Urban population of the district as per cent of total population

Note: In the case of infrastructure the items considered are roads, phone, school, health facility, Village Level Worker (agricultural extension), post office and market for produce.