CDE
July, 1999

Centre for Development Economics

Impact of Household Size, Family Composition and Socio Economic Characteristics on Poverty in Rural India

J.V. Meenakshi
&
Ranjan Ray

Working Paper No. 68

ACKNOWLEDGEMENTS

The work on this paper was started when the second author was a visitor to the Centre for Development Economics. Subsequently, the work was partially supported by a grant from the Australian Research Council. We are grateful to Geoffrey Lancaster and Souvik Gupta for research assistance, and to a referee for helpful comments.

ABSTRACT

This paper utilises micro data on consumption, family composition and land ownership of nearly 70,000 rural Indian households to analyse poverty. The study combines household level information with State level welfare indicators to examine the impact of household size and composition, caste, sex of head, land ownership and other socio economic characteristics on a household's poverty status. The introduction of consumption economies of household size and of adult/child consumption relativities affect the poverty estimates but not the State poverty rankings. Female headed households, scheduled castes/tribes, and households residing in economically backward and/or expensive States are more vulnerable to poverty than others. The logit regression results point to the positive role that the State governments can play in reducing rural poverty.

JEL Classification : C81, D63, I32, J18, o57
Keywords : Economies of Household Size, Adult Equivalence Scales, Head Count Poverty Rate, Land Deprivation, Female Headed Households, Scheduled Castes and Scheduled Tribes

1. Introduction

The issue of sensitivity of poverty estimates to the treatment of household size has recently attracted considerable attention [Buhmann, et al (1988), Coulter, et al (1992), Lanjouw and Ravallion (1995), Dreze and Srinivasan (1997), Lancaster, et al (1999)]. Much of the interest in these studies has focussed on the impact of allowing economies of household size on the poverty calculations. The results of Lanjouw and Ravallion (1995) on Pakistan data show, for example, that the presence of size economies in consumption is likely to counter the widely held view that larger families tend to be poorer in developing countries. Dreze and Srinivasan (1997) observe on India's National Sample Survey data that "poverty indices for different household types ... are quite sensitive to the level of economies of scale" (p. 217). The empirical literature on developed countries also points to the importance of size economies in welfare comparisons across households. Nelson (1988) found evidence on US data of "existence of significant economies of scale in the consumption of all the included goods, with economies being especially pronounced in the consumption of shelter". Buhmann, et al (1988), using cross country data from the Luxembourg Income Study data base of 10 developed countries, and Coulter, et al (1992), using the UK Family Expenditure Survey data, both found sensitivity of inequality and poverty estimates to the presence of size economies in consumption and, more generally, to the equivalence scale relativities used in the welfare comparisons. In an analysis of Norwegian data, Ringen (1991) found that comparisons of standards of living over time do depend on whether a per equivalent or a per capita measure is used.

Most of the studies, referred to above, assume a common functional form for the equivalence scale, namely, N^{θ} where N is household size, ie. the unweighted number of members in the household. The parameter θ is, therefore, relied upon to pick up not only the size economies of consumption but, also, the effect of change in household composition

between adults and children. The latter follows from the non identical consumption needs between adults and children, a fact that is central to the equivalence scale literature. The empirical literature on the sensitivity of poverty calculations to the equivalence scale specification does not, usually, distinguish between the effects of household size and family composition on the estimates. In developed countries, the two effects are likely to be related, since larger families will tend to be younger or, at least, will have more young children. The situation is quite different and more complex in the developing countries, especially in the Indian sub continent, with the prevalence of the joint family system, and with children staying on with their parents to a much later age than in the advanced countries. The absence of any direct role for changes in household composition in the equivalence scale specification, N^{θ}, raises the issue of robustness of the earlier findings to the explicit recognition of non identical needs between adults and children. Such an investigation based on the unit records from Indian National Sample Survey data constitutes one of the principal motivations of this study. A prima facie case is provided by the results of Lancaster, et al. (1999) who observe, on cross country micro data from a selection of developing and developed countries, that some of the relationships observed earlier between poverty estimates and size economies of consumption are unlikely to be robust in the presence of household compositional variables.

The recent availability of household level micro consumer expenditure survey data by the National Sample Survey Organisation offers exciting opportunities to contribute to the rich literature on poverty and welfare changes in India. In this paper, we exploit the household level information to examine the extent to which poverty comparisons are influenced by (a) demographic factors and (b) alternative poverty lines. We also extend the analysis to include social groups believed to be particularly vulnerable to deprivation: scheduled caste/scheduled tribe and female headed households. The analysis pertains to the

50th round of the NSS consumer expenditure survey, carried out in 1993/1994, and is restricted to rural India.

Poverty studies on India have tended to ignore the question of economies of household size in consumption [see, for example, Dreze and Srinivasan (1996), Dubey and Gangopadhyay (1998), Datt and Ravallion (1998)]. Traditional analyses of poverty and welfare are conducted on a per capita basis, wherein households whose per capita incomes fall below a pre specified norm are identified as being poor. This approach ignores the fact that household members cooperate with each other and thereby get more out of their household incomes than would be possible if members operated as individual households. This includes the sharing of several fixed-cost components of a running household: rent for Housing is the most obvious example of this. Further, larger households may be able to take advantage of bulk discounts associated with larger purchases of a given commodity, say, cereals and thereby achieve a greater level of utility than could a smaller household. As already explained, this objection to the use of family size as the expenditure deflator is distinct from the argument that it overlooks the non identical needs between the different members of the household, most notably, between adults and children.

While the importance of incorporating household size and composition in welfare analysis has long been recognised, empirical work on Indian data has been relatively scarce. One exception is the study by Dreze and Srinivasan (1997) who utilise disaggregated data on household size and composition to analyse the economic position of female headed households. They experiment with a variety of adult equivalent scales and economies of household size parameters for rural India. They find that the poverty ranking of different household types is invariant to the choice of adult equivalence scales, but is sensitive to the choice of economies of household size parameters. The Dreze and Srinivasan (1997) study, like Buhmann, et al (1988), does not estimate these parameters but examines the sensitivity of

the results to the choice of a range of possible values of these parameters. Moreover, in common with most welfare analysis on Indian data, the Dreze and Srinivasan exercise does not allow the size economies and the adult equivalence scales to vary between the different regions in India. This is contrary to the evidence presented in Meenakshi and Ray (1999) which confirms that the impact of household size and composition on expenditure pattern varies sharply between the different States in India.

The present study extends the empirical literature on poverty in India in principally the following respects:

(i) We explicitly introduce in the equivalence scale functional form both household size and household composition variables, namely, the number of adults and children in the household. This allows us to test, simultaneously, for the presence of economies of household size and of non identical consumption needs between adults and children.

(ii) We exploit the rich household level information contained in the unit records, made available recently by the National Sample Survey Organisation, to estimate simultaneously the size economies and adult equivalence scale parameters for each of the constituent States of the Indian Union. The fact that the present study estimates these parameters rather than experiment with alternative starting values constitutes a significant departure from the previous literature.

(iii) The issue of sensitivity of poverty calculations is examined not only with respect to the demographic parameters, as discussed above, but also with respect to the poverty line expenditure used in the calculations.[1] We investigate the sensitivity of the poverty rankings of the Indian States to alternative poverty lines. These differ from each other not only because of the different parametric values of the adult equivalence scale, but also because of differences in the way the poverty level expenditure is defined. In the latter context, we compare the State poverty rankings based on the nutritionally determined OPL (official poverty line) with that based on a priori specified cut offs for budget share of Cereals. The OPL in India is anchored in the cost of a normative minimum food basket that ensures 2400 calories per capita per day in rural areas, and is updated using State specific cost of living indices as recommended by Minhas, et al (1990). An alternative way of specifying the poverty line is the 'Food Ratio' method that has the appeal of simplicity in terms of its conceptual basis. It is based on the Engel observation that the proportion of income spent on necessities tends to fall as incomes rise. A threshold distinguishing the poor from the non poor can thus be framed in terms of the expenditure level at which a specified proportion spent on necessities is just reached on average. This approach has been employed by Statistics

[1] See Nolan and Whelan (1996, Ch 2) for a comprehensive review of the alternative poverty lines used in the literature.

Canada to produce low income cut offs and has, also, been used quite widely in developing countries [see Rao (1981)]. Notwithstanding its considerable appeal because of its simplicity and modest information requirements, the 'Food ratio' method is not without its limitations [see, for example, Chaudhuri and Ravallion (1994)]. In the present study, the 'Food Ratio' method is implemented using a priori specified threshold share of Cereals in the household budget: high cereal share is indicative of an impoverished household, while a low cereal share indicates that the household is food secure. This still leaves open the question of what constitutes the cut off between 'high' and 'low' cereal shares. There is no straight forward answer: we try a pair of cut offs and examine whether the results are robust.

(iv) In an attempt to identify households that are particularly vulnerable to poverty, we pay special attention to two groups: (a) female headed households (FHH), and (b) those belonging to scheduled castes and scheduled tribes (SC/ST). There is now considerable evidence to suggest that FHH are poorer than others (see, for example, Buvinic and Gupta (1997)'s evidence on Chile), though Dreze and Srinivasan (1997) observe that this result, in the case of widowed households, is sensitive to the presence of size economies of consumption. The vulnerability of SC/ST households to acute poverty is recognised in the arrangements for job reservations made for these groups in India. However, there exists little evidence on the magnitude of poverty experienced by the backward classes in India. The present study will attempt to throw light on this issue.

(v) This study widens the scope of the poverty analysis by presenting evidence on relative land deprivation in India's rural areas based on a measure of landlessness proposed in this paper. Land ownership is an important source of income in the rural areas. Though it is misleading to identify landlessness with poverty, it is interesting to examine the extent to which the picture on land deprivation in the different States in India resembles that on poverty.

To focus our minds more concretely on the principal features of this study, let us list below the substantive questions that we seek to answer.

(i) Do there exist significant size economies of consumption even in the presence of non identical consumption needs between adults and children? Do the estimates of economies of scale of household size, and of adult equivalence scales, vary across the States of the Indian Union?

(ii) Do the poverty estimates and the poverty rankings of the different States vary between the conventional treatment of household size as the unweighted sum of individual members, and one where we allow both size economies of scale and non identical consumption needs between adults and children?

(iii) Are the poverty estimates and the poverty rankings of sensitive to the poverty line, namely, between the nutritionally based, official poverty line (OPL) and the, cereal share based, behaviourally determined poverty line (BD)? How do these estimates and rankings compare with those based on an index of land deprivation (LD)?

(iv) Do the female headed households (FHH) and those belonging to the backward classes (SC/ST) face higher poverty rates than the rest of the population? More generally, what are the principal determinants of the likelihood of a household living in poverty? Can the poverty experience of a household be significantly affected by the success of the welfare policies adopted in its State of residence in matters such as schooling, infant mortality and public distribution of food grains to the rural poor?

These are clearly questions of considerable policy concern. The Federal government in India has adopted poverty alleviation as an important criterion in the disbursement of Central assistance to the constituent States. Moreover, as attention has shifted in the poverty literature to the targeting of anti poverty strategies at groups that are considered to be particularly vulnerable to poverty, the answers to (iv) hold considerable policy interest.

The remainder of this paper is as follows. Section 2 presents the methodology used in this study. The data is described, and its principal features are discussed in Section 3. The results are presented and discussed in Section 4. The main conclusions are summarised in Section 5.

2. Methodology

2.1 Demand Systems, Size Economies and Equivalence Scales

The estimates of economies of household size and of adult equivalence scales were obtained by estimating the following Engel curves expressed in budget share terms, w_i:

$$w_i = \alpha_i + \beta_i\left[\log\left(Y/N\right)\right] + \gamma_i\left[\log\left(Y/N\right)\right]^2 + \delta_{i1}D_1 + \delta_{i2}D_2 + \delta_{i3}L + u_i \qquad i = 1,\ldots,n \qquad (1)$$

where Y is aggregate household expenditure, $N = \left(n_a + \rho n_c\right)^{\theta}$ is the economies of scale and equivalence scale adjusted measure of household size. n_a, n_c denote the number of adults, children, respectively, in the household and θ, ρ are the demographic parameters. D_1, D_2 are dummy variables corresponding to households belonging to SC/ST and FHH respectively, L

is the size of landholdings owned by the household, and u_i is the stochastic error term. Owing to the presence of non linearity and cross equation restrictions because of the parameters ρ, θ appearing in each equation, (1) was estimated as a system of equations using non linear FIML and the SHAZAM (version 8.0) computer package. Note that when $\theta = \rho = 1$, N specialises to the conventional treatment of household size as simply the number of members in the household. All the households within a State are assumed to face the same prices in a given time period. The quadratic coefficients, γ_i, allow the possibility of items changing from necessities to luxuries or vice versa as we move across the expenditure spectrum.

2.2 *Alternative Poverty Lines*

Using the estimates of θ, ρ, for each State, the alternative poverty lines can be obtained as follows:

(i) The State specific poverty lines, taking account of size economies and equivalence scale relativities, were obtained by multiplying the per capita OPL figures reported for each State in Dubey and Gangopadhyay (1998, Table S2.2A) by $(\bar{n}_a + \rho\bar{n}_c)^{1-\theta}$, where $\bar{n}_a$ is the average number of adults, and $\bar{n}_c$ is the average number of children in the State sample.[2] Within the framework set by the official poverty line, we obtain 4 different versions of this line, namely, (a) OPL1 when ρ, θ take on their estimated values, (b) OPL2 when $\theta = 1$, and ρ takes on the estimated value, assuming absence of size economies, (c) OPL3 in the per capita case[3], ie. $\theta = \rho = 1$ (assumed), and (d) OPL4 when $\rho = 1$, and θ takes on its estimated value assuming identical weights for adults and children.[4]

(ii) The alternative poverty line, considered here, fixes it at the level of expenditure at which a single adult household spends a pre-specified share, $\hat{w}_c$, of the household budget on Cereals and Cereal substitutes. From the parameter estimates $(\hat{\alpha}_c, \hat{\beta}_c)$ of the Cereals equation, and considering only the linear version of eqn. (1) for simplicity (ie. assuming $\gamma_c = 0$), the behaviourally determined poverty line (BDPL) for a single adult household is given by:

---

[2] See Dreze and Srinivasan (1997, p 225) for an explanation of this particular form of poverty line adjustment, extended here to allow for $\rho \neq 1$.

[3] OPL3 coincides with the OPL figures reported by Dubey and Gangopadhyay (1998).

[4] OPL4 is the case considered by Buhmann, et. al. (1988), Lanjouw and Ravallion (1995), Dreze and Srinivasan (1997).

$$BDPL = \exp.\left[\frac{\hat{w}_c - \hat{\alpha}_c}{\hat{\beta}_c}\right] \qquad (2)$$

The poverty lines for the different households, varying in size and composition, can then be constructed from BDPL using the same adjustment as described above for OPL. In the calculations reported below, we use only the most general equivalence scale specification ie. use θ, ρ at their estimated values for each State as with OPL1. We investigate the sensitivity of the poverty estimates to the Cereal share cut off by reporting the calculations at two threshold values $(\hat{w}_c = 0.35, 0.4)$.

(iii) In addition to the poverty estimates, we examine the extent of landlessness or land deprivation in the rural areas of India by using the index, LD, to denote the percentage of households with land holdings per equivalent adult that is less than 50% of the sample mean of per equivalent land holdings[5].

2.3 *Determinants of Poverty*

The latter part of this study attempts to answer question (iv), posed above, on the determinants of rural poverty by estimating the logit regression of a household's poverty status (1, if poor, 0, otherwise) on the following variables: (a) number of children in the household, (b) number of its adults, (c) a dummy variable that takes the value 1 if the household belongs to SC/ST, 0 otherwise, (d) a dummy variable that takes 1 if the household is FHH, 0 otherwise, (e) area of land owned by the household, (f) rural price level in the household's State of residence, (g) per capita State domestic product, (h) female life expectancy, (i) infant mortality rate, (j) proportion of children in the age group 5-9 years that attend school, (k) proportion of children in the age group 10-14 years that attend school, (l) female labour participation rate, (m) per capita supply of food grains through public distribution, (n) proportion of population receiving food grains through public distribution, and (o) proportion of households with access to safe water. While the poverty determinants (a) – (e) are household specific, the determinants (f) – (o) are State specific, with values

[5] See Buhmann, et al (1988), Coulter, et al (1992), Lancaster, et al (1999) for an analogous use of the half sample median or half sample mean of equivalent expenditures as the poverty line in the context of poverty measurement.

relevant to the State of residence of the household. All households within a State face the same values of the socio-economic characteristics for that State (ie, variables (f) – (o)). These variables do not, therefore, suffer from endogeneity in the logit regression of the poverty status of the individual households. Note, also, that wherever available, we have used the values of the State specific variables that apply to the rural areas. The State rural price index (variable f) was obtained by dividing the State wise OPL figures for 1993/94 presented in Dubey and Gangopadhyay (1998, p 56) by the minimum OPL figure reported there. In other words, the rural State price index is based at unity for Madhya Pradesh which had the lowest OPL figure. The subsistence cost of living that variable f measures was found to vary widely across the constituent States of the Indian Union.

3. Data and Its Principal Features

The data base for this study is provided by the unit record data on consumer expenditure in the rural areas collected for each of the States in India in the 50th round of the National Sample Survey (1993/94). The following 11 commodity expenditure classification was used in estimating the economies of household size and the adult equivalence scale parameters: Cereals and Cereal Substitutes; Pulses and Pulse Products; Milk and Milk Products; Meat, Eggs and Fish; Edible Oils; Vegetables and Fruits; Sugar and Gur; Other Food; Clothing and Footwear; Fuel and Light; Other Non Foods.

For rural India as a whole, 68102 households were surveyed in 1993/94. The present study uses the original micro data from this survey. Following the results of our earlier work, [Meenakshi and Ray (1999)], the analysis is carried out separately for each State. The sample size varies from State to State: while the number of observations for the smaller States is less than 500, those for the larger States is over 5000. The demand estimation is carried out only over observations for which the records are complete for each of the above commodity

groups. For calculating the head count ratio of poverty, however, the entire sample is used. The information on the State level socio economic characteristics, used as determinants in the logit regressions of the poverty variable in the latter part of this study, was taken from Dreze and Sen (1995, Appendix Table A3).

Table 1 presents the summary statistics of some of the principal variables of interest in this study. This table also contains the corresponding information on the SC/ST and Female headed households in each State. Household size and cereal share, in particular, vary considerably between States. The rich States of Punjab and Haryana have low average Cereal shares (around .15), while in the poorer States of Bihar and Orissa, the average Cereal share rises to around 0.4. We also observed that the distribution of cereal share across households is skewed in the richer States, for example, Punjab and Haryana with the mode lying between 0.1 and 0.2, whereas the distribution is more symmetric in Bihar, and the corresponding mode is also much higher, lying between 0.3 and 0.4. There is thus a priori reason to expect that the behaviourally determined poverty rates (BD) based on a-priori specified Cereal shares may well rank States differently from those based on the official poverty line (OPL). The female headed households are smaller in size compared to the others. Both the groups, namely, SC/ST and FHH, generally own considerably less land holdings than the others. In per capita terms, however, the FHH enjoy, in most States, higher aggregate expenditure than the others. However, as we report later, this picture of relative affluence of the FHH changes drastically if we allow size economies of scale and non identical consumption needs between adults and children.

Table 2 reports the sample correlation between the state wise mean values of the major variables. These show some variation in the magnitudes between the SC/ST and FHH groups. The nature and magnitude of association between per capita total expenditure (PCTE) and household size has attracted considerable attention. Table 2 shows that, in contrast to the

rest of the population, the larger sized FHH do enjoy significantly higher per capita expenditure. The expected positive association, at the aggregate State level, between per capita total expenditure and the size of the household's land holdings is only a weak one as seen from the statistical insignificance of the estimated correlation coefficients.

4. Results

Table 3 presents the estimates, for each State, of the economies of household size, θ, and of the adult equivalence scale, ρ, under the quadratic and linear specifications [see eqn. (1)]. This table also reports the estimate of the quadratic coefficient γ_c in the Cereals share equation. The following results emerge from this table.

(i) Regardless of which Engel curve specification one adopts, there is wide variation across States in the estimates of θ and ρ. The present evidence does not, therefore, support the normal practice on Indian data of using the same expenditure deflator in all States to correct for changes in household size and composition in making welfare comparisons across households.

(ii) With the solitary exception of the θ estimate for Sikkim, the estimates of θ and ρ are sensible and well determined in nearly all cases. The quadratic coefficient (γ_c) of the Cereals equation is significant in most of the States. There is some variation in the estimates of θ, ρ between the linear and quadratic specifications, though the differences do not seem large enough to justify the increased computations in the latter estimation.

(iii) Almost without exception, the estimates of θ and ρ are significantly different from unity. In other words, the data finds evidence of significant economies of household size and of non identical consumption needs between adults and children and, thus, rejects the common practice of using per capita expenditure in the poverty calculations. We also observed that, in all cases, the most general demographic specification, ie. with $\theta \neq 1$, $\rho \neq 1$, leads to a significant likelihood based improvement over that with $\theta \neq 1$, $\rho = 1$ (imposed). This suggests that the recent practice of using N^{θ} as the equivalence scale, with N denoting the number of household members may not be satisfactory either since the size economies parameter, θ, cannot be relied upon to pick up satisfactorily the effect of changes in household composition between adults and children. The household compositional variables need to be explicitly introduced in the equivalence scale specification.

Table 4 provides evidence on the sensitivity of the head count measures of household poverty to the alternative demographic adjustments of OPL, including the conventional per capita treatment implicit in OPL3, and between the 'Cereal Ratio' Method and the OPL variants. This table also reports, for each State, the index of 'land deprivation' (LD) or landlessness, as defined earlier. The State rankings, corresponding to the various poverty lines and indices , are presented in Table 5 with 1 denoting the poorest State and so on. The following conclusions follow.

(i) Comparing the most general and most restricted treatment of household size, namely, OPL1, OPL3, we find that the introduction of economies of household size and non identical consumption needs between adults and children leads to a sharp reduction in the estimate of household poverty. A further comparison between the OPL1 and OPL4 based poverty estimates shows that, in the absence of explicit presence of household compositional variables (ie. $\rho = 1$), the simple introduction of economies of household size, ie. non unitary θ, is unlikely to yield a satisfactory outcome, since the latter estimates are still completely out of line, indeed highly upward biased, in relation to the former. Table 5 shows, however, that, unlike the poverty estimates, the State poverty rankings are not very sensitive to the alternative variants of OPL. In contrast, the State poverty estimates and the poverty rankings are both highly sensitive to the methodology used in setting the poverty line, ie. they vary sharply between BDPL and OPL. Note, incidentally, that the revision to the poverty estimates between these methods is not always unidirectional. The high sensitivity of the BDPL poverty estimates to the budget share of Cereals used as cut off, coupled with the fact that any cut off adopted has to be ad hoc, constitute a serious limitation of the 'Cereals Ratio' method.

(ii) The estimates of landlessness (LD) generally show a much higher level of deprivation than is implied by the poverty estimates. The rich States of Punjab and Haryana experience a higher level of landlessness in the countryside than several of the poorer States. We should stress, however, that LD conveys only an incomplete picture on poverty, since not all landless households are poor nor are all large landowners above the poverty line.

(iii) The results on the sharp sensitivity of the State poverty rankings to the choice of method in fixing the poverty line (BDPL, OPL) and their robustness to the economies of household size and scale relativities between adults and children (OPL1 – OPL4) are confirmed by the Spearman rank correlation estimates and their standard errors presented in Table 6.

Tables 7, 8 present the estimates of household poverty and of landlessness of the SC/ST and FHH groups, respectively, in each State. A comparison of the poverty estimates

reported in Tables 4, 7, 8 shows that these groups experience higher poverty than the others. Note that this picture is robust between measures (BDPL, OPL, LD) and between their variants. The SC/ST and FHH register much higher levels of land deprivation than the rest of the population. For example, in the rich agricultural States of Punjab and Haryana, over 90% of the SC/ST households are landless. Female headed households in Punjab exhibit one of the highest levels of landlessness among all female headed households in rural India. Even in States like Kerala and West Bengal, with an impressive record of land reforms under Communist rule, these minority groups, especially SC/ST households in Kerala, exhibit high levels of landlessness.

Table 8 shows that, in sharp contrast to the other groups, the poverty rates of the FHH generally increase with the introduction of size economies and scale relativities between adults and children ie. when we move from OPL3 to OPL1. FHH are generally smaller in household size and older in average age compared to the others and, hence, less able to take advantage of size economies in consumption, and of the lower consumption needs of the child in relation to the adult. This is confirmed visually by Fig. 1 which presents the picture on poverty, using poverty lines OPL1 and OPL3, in six of the larger States in India. In Andhra Pradesh and Madhya Pradesh, for example, the introduction of size economies of consumption and of scale relativities between adults and children makes the FHH, under OPL1, one of the poorest subgroups in these States. Fig. 2, which presents the picture on poverty in these six States by the size of landholdings, confirms that the household poverty rates do fall with an increase in the size of landholdings. It is noticeable, however, that there are some poor households among those with "large land holdings". It will be useful to analyse the characteristics of such households in future research.

Table 9 presents the parameter estimates of the logit regression of the qualitative variable P, denoting a household's poverty status, on a selection of its demographic and socio

economic characteristics. P takes the value 1 if the household is poor, and 0 otherwise. The estimated coefficients measure the impact of a unit increase in the explanatory variable on the log odds ratio of a household living in poverty. While the household characteristics are contained in the NSS unit records, the information on State price index and other State level characteristics were obtained from elsewhere as described earlier. The availability of the socioeconomic indicators for only the major States meant that we had to delete the unit records of households residing in the smaller states from the logit regression. The pooled data involved a sample of 61,835 rural households, of whom 21,791 were found to be "poor" giving us a head count poverty estimate of 35.24% for rural India as a whole in 1993/94. The following conclusions follow from the table.

(i) The estimated coefficients confirm our earlier observation that SC/ST and female headed households are more likely than others to live in poverty

(ii) Land ownership is a significant sources of poverty alleviation in rural areas with an increase in the size of landholdings leading to a sharp reduction in the likelihood of a household living in poverty.

(iii) Coefficients of the number of children and adults have the expected sign.

(iv) Higher prices of subsistence items lead to a large increase in the likelihood of a household living in poverty. In other words, controlling for other characteristics, households residing in States with high cost of living are much more vulnerable to poverty. The large magnitude of the estimated coefficient of the rural price variable points to the importance of the public distribution system in the anti poverty strategy by making subsistence items available to the rural poor at subsidised prices, especially in the more expensive States.

(v) All other State level socioeconomic variables record significant impact on a household's poverty status. The estimated coefficients are, generally, sensible and well-determined. Households residing in the more affluent States, as measured by the net domestic product, are less likely to face poverty. Households residing in States where relatively more children are enrolled in schooling are less vulnerable to poverty. Increase in the per capita supply of food grains through

public distribution, and increased supply of safe water per household also help to significantly reduce rural poverty. In contrast, a simple increase in the coverage of the public distribution of food grains is unlikely to help reduce rural poverty. This suggests that an effective anti poverty strategy should direct the supply of subsidised food grains at the poor rather than spread it thinly over a wide section of the rural community.

(vi) Infant mortality rate has a positive effect in reducing household poverty. In other words, households residing in States, eg. Kerala, which have done well on infant mortality by reducing the mortality rates of their infants to well below the national average are, after controlling for the other characteristics, less likely to experience poverty. In contrast, households residing in States with higher female life expectancy (again, Kerala is a good example) are, ceteris paribus, more likely to experience poverty. This last result is, probably, not as unexpected as it appears for it points to households with large number of non working, elderly dependents as being particularly vulnerable to poverty. This prompts the need to direct assistance at the elderly, as life expectancy increases in response to improved medicine, healthier living conditions and other benefits of economic progress.

(vii) The low wages of working females partly explain our earlier observation on the higher incidence of poverty among female headed households. This is also reflected in the fact that households residing in States with higher female labour participation rates are more vulnerable to poverty. The policy significance of this result is clear – an increase in female wages and other improvements in the conditions of female employment are likely to prove effective strategies in alleviating poverty.

The overall message from these results is as follows. In disbursing Central assistance to the constituent States to fight poverty, priority should be given to States and, within them, regions that have failed to secure satisfactory economic progress in relation to the national average. For, as the statistically significant coefficient estimate of the per capita SDP variable in the logit regression shows, households in these economically backward regions are at the greatest risk from poverty. Other criteria for distributing Central aid to fight poverty should include higher priority accorded to States which have not done well in areas such as increased schooling and literacy of its children, reducing infant mortality, provision of subsidised food grains to the rural poor in satisfactory quantities, improved wage and other conditions of female employment, and keeping a lid on escalating prices of essential items that figure prominently in the subsistence budget that constitutes the 'official poverty line' (OPL).

Alternatively, Central assistance could be linked to satisfactory State performance in these areas of vital public concern and welfare. Our results also point to the need to direct aid to groups such as female headed households and scheduled castes and tribes. As the evidence presented above suggests, even in the affluent States, these groups could be in need of special targeted assistance.

5. Summary and Conclusion

This paper exploits the rich information from the 50th round of the National Sample Survey of household expenditure in rural India conducted in 1993/94 and recently made available in its original unit record form. We combine the expenditure and demographic information contained in the unit records of nearly 70,000 households with the socio economic indicators on various States, compiled by Dreze and Sen (1995), to analyse rural poverty in India.

The study initially tests for the presence of significant consumption economies of household size and of non identical consumption needs between adults and children by estimating the corresponding behavioural parameters for each of the constituent States of the Indian Union. Nearly all the States confirm the simultaneous presence of these demographic effects. The results argue against the conventional use of unadjusted household size as the expenditure or income deflator in the poverty calculations. They also suggest that the household size economies parameter cannot be relied upon to satisfactorily pick up household composition effects as well. The head count poverty rates fall, quite sharply in many cases, with the introduction of the State specific consumption economies of household size and of adult/child relativities in the equivalence scale used as the expenditure deflator. A significant exception is provided by the experience of the female headed households for whom the poverty rates move in exactly the opposite direction, ie. rise in the presence of size

economies, reflecting their inability to take advantage of the demographic adjustments because of their smaller size, and the smaller number of children in these households.

In contrast to the poverty estimates, the State poverty rankings are fairly robust between the alternative demographic adjustments to the poverty line based on the alternative values assigned to the parameters in the equivalence scale specification. However, the State poverty rankings change significantly between the alternative methods used to determine the poverty line itself, namely, between the behaviourally determined method using the budget share of Cereals, and the official poverty line based on nutritional requirements. Scheduled caste, scheduled tribe and female headed households face higher poverty rates than the rest of the rural population.

The latter part of the study investigates the determinants of rural poverty by combining the household level information with several State level welfare indicators in a logit regression of the poverty status of a household on a host of demographic and socio economic characteristics. The regression on the pooled all India rural sample of over 60,000 households was designed to give us an idea of the profile of a rural household that is particularly vulnerable to poverty. The results suggest that households residing in economically backward regions and/or the most expensive States are more likely than others to live in poverty – a point that needs to be recognised in the disbursement of Central assistance to the constituent States. The results also point to the positive role that the State governments can play in reducing poverty by increasing the School enrolment of children, by reducing infant mortality, by taking anti-inflationary measures to curb the rising prices of subsistence items, and by directing the public distribution of subsidised food grains at the most impoverished sections of the rural community. Moreover, the regression results point to the importance of land ownership in raising rural living standards, and, consequently, to the significant role that land reforms can play in curbing rural poverty by increasing the size of

land holdings owned by the rural poor. It is worth noting, for example, that, notwithstanding the impressive record of land reforms in the States of Kerala and West Bengal, unacceptably high levels of landlessness or 'land deprivation' still prevail in these States, especially among the SC/ST households in Kerala. In the agriculturally prosperous States of Punjab and Haryana, over 90% of the SC/ST households are deprived of any significant amount of land ownership.

Rural poverty, especially in the Indian subcontinent, is a complex phenomenon – for an insightful analysis of rural poverty in India, see Galbraith (1979). The causes of rural poverty are many and varied. The choice of variables as determinants in the logit regression of this study was dictated by the availability of information. Though limited in scope, the statistical significance of several of the State welfare indicators in their impact on household poverty point to the potential that the State governments possess in curbing poverty. Clearly, more research needs to be done to identify target groups for directing poverty alleviation strategies, and to determine the strategies that are likely to be effective. The present study, we hope, is a step in that direction.

Table 1 : Summary Statistics of Key Variables

Sample Size	All Households	SC/ST Households	Female Headed Households

Table 1 : Summary Statistics of Key Variables*

State	Sample Size	All Households					SC/ST Households					Female Headed Households				
	No. of Households	Per Capita Total Expenditure	Household Size	No. of children per household	Land Owned (hectares)	Cereal Share	% living in SC/ST households	Per Capita Total Expenditure	Household Size	Land Owned (hectares)	Cereal Share	% living in female headed households	Per Capita Total Expenditures	Household Size	Land Owned (hectares)	Cereal Share
Andhra Pradesh	4908	308.53	4.16	1.41	0.75	0.27	25.6	258.48	4.05	0.45	0.30	6.1	299.05	2.43	0.39	0.27
Arunachal Pradesh	1065	360.35	4.59	1.66	1.86	0.32	90.1	324.15	4.83	2.14	0.33	3.8	312.55	2.57	1.32	0.32
Assam	3199	267.70	5.09	1.86	0.73	0.35	24.9	262.75	5.06	0.88	0.36	4.1	264.47	3.94	0.36	0.30
Bihar	6979	230.34	4.99	1.99	0.69	0.39	27.9	207.18	4.58	0.53	0.43	5.6	229.82	3.52	0.46	0.38
Goa	146	503.87	4.29	0.89	0.37	0.16	8.0	450.14	4.14	0.12	0.15	18.4	426.01	3.38	0.27	0.16
Gujarat	2219	326.7	5.05	1.75	1.21	0.18	32.8	287.29	4.92	0.58	0.19	4.0	333.74	3.60	0.57	0.17
Haryana	1040	412.77	5.55	2.28	1.41	0.15	25.1	303.83	5.46	0.51	0.18	6.0	450.65	4.23	0.99	0.14
Himachal Pradesh	1875	395.56	5.01	1.75	0.81	0.21	27.5	330.02	4.93	0.58	0.24	15.7	440.34	4.01	0.67	0.20
Jammu & Kashmir	819	378.26	5.65	2.20	0.97	0.23	28.9	352.14	5.71	0.63	0.26	10.8	399.52	4.79	0.75	0.23
Karnataka	2617	288.59	5.11	1.81	1.24	0.24	26.2	242.5	5.00	0.67	0.26	8.4	281.47	3.55	0.80	0.25
Kerala	2555	422.91	4.56	1.33	0.29	0.20	9.9	319.55	4.27	0.10	0.23	19.3	421.99	3.99	0.29	0.20
Maharashtra	4440	293.99	4.73	1.70	1.34	0.20	27.6	245.86	4.59	0.79	0.21	5.9	315.45	2.86	0.84	0.20
Manipur	1000	308.82	5.33	1.91	0.85	0.41	42.9	307.65	4.98	0.94	0.42	6.5	344.54	4.30	0.51	0.37
Meghalaya	1116	349.82	4.43	1.48	0.77	0.26	95.5	343.36	4.46	0.80	0.26	16.6	373.83	3.94	0.61	0.24
Mizoram	470	414.57	5.01	1.79	1.40	0.21	100.0	414.76	5.02	1.42	0.21	6.8	456.28	3.97	1.17	0.20

* The figures denote sample means; the per capita total expenditure figures relate to expenditure over 30 days.

Table 1 : (Continued)

State	Sample Size	All Households					SC/ST Households					Female Headed Households				
	No. of Households	Per Capita Total Expenditure	Household Size	No. of Children per Household	Land Owned (hectares)	Cereal Share	% living in SC/ST Households	Per Capita Total Expenditure	Household Size	Land Owned (hectares)	Cereal Share	% living in female headed households	Per Capita Total Expenditure	Household Size	Land Owned (hectares)	Cereal Share
Madhya Pradesh	5312	260.3	5.11	1.94	1.82	0.30	43.6	223.77	4.79	1.40	0.33	3.2	265.77	2.92	1.07	0.38
Nagaland	460	465.76	5.29	1.97	1.59	0.28	96.3	458.74	5.33	1.65	0.28	3.0	467.15	3.79	1.27	0.28
Orissa	3338	234.03	4.71	1.64	0.70	0.42	40.1	205.71	4.36	0.59	0.44	5.5	248.64	2.91	0.52	0.41
Punjab	2046	455.85	5.19	1.78	1.25	0.12	33.8	378.74	4.98	0.37	0.14	5.1	613.74	4.04	0.77	0.12
Rajasthan	3096	340.3	5.23	2.11	2.60	0.20	32.0	291.41	4.99	1.57	0.22	5.0	361.10	3.51	1.83	0.20
Sikkim	480	347.14	4.11	1.36	0.73	0.24	27.3	346.76	4.19	0.78	0.24	4.3	374.12	3.26	0.93	0.24
Tamil Nadu	3901	309.22	4.04	1.25	0.39	0.29	25.1	252.6	4.03	0.16	0.31	10.0	302.87	2.69	0.23	0.29
Tripura	1530	361.41	4.45	1.58	0.64	0.28	38.3	328.13	4.41	0.66	0.30	4.5	325.38	2.56	0.30	0.30
Uttar Pradesh	9011	293.27	5.35	2.20	0.85	0.25	22.1	242.99	4.91	0.39	0.29	5.1	301.44	3.55	0.52	0.26
West Bengal	4480	293.06	4.99	1.92	0.39	0.38	37.1	256.04	4.81	0.32	0.41	4.9	285.88	3.32	0.27	0.37

[illegible]

Table 2: Correlation Between the State Mean Values of the Variables

	Per Capita Total Expenditure	Household Size	Land Owned	Cereal Share
All Households				
Per Capita Total Expenditure	1.00	0.01	0.05	-0.69[a]
Household Size		1.00	0.45[a]	-0.04
Land Owned			1.00	-0.23
Cereal Share				1.00
SC/ST Households				
Per Capita Total Expenditure	1.00	0.18	0.19	-0.56[a]
Household Size		1.00	0.37	-0.12
Land Owned			1.00	0.11
Cereal Share				1.00
Female Headed Households				
Per Capita Total Expenditure	1.00	0.52[a]	0.26	-0.73[a]
Household Size		1.00	0.09	-0.36
Land Owned			1.00	-0.24
Cereal Share				1.00

[a] Statistically significant at 5% level of significance.

Table 3: Selected Parameter Estimates[a] of Cereals Share Equation

State	Quadratic Specification			Linear Specification	
	θ	ρ	γ_c	θ	ρ
1. Andhra Pradesh	.61	.48	-.03	.66	.53
	(.02)	(.03)	(.002)	(.02)	(.03)
2. Arunachal Pradesh	.64	.75	-.03	.57	.90
	(.03)	(.08)	(.01)	(.04)	(.13)
3. Assam	.60	.81	-.09	.62	.89
	(.02)	(.04)	(.01)	(.02)	(.04)
4. Bihar	.68	.65	-.07	.67	.70
	(.01)	(.02)	(.003)	(.01)	(.02)
5. Goa	.67	.52	-.04	.81	.56
	(.07)	(.14)	(.01)	(.09)	(.16)
6. Gujarat	.75	.77	-.01	.74	.75
	(.02)	(.04)	(.003)	(.03)	(.05)
7. Haryana	.91	.70	.01	.89	.69
	(.03)	(.04)	(.003)	(.04)	(.06)
8. Himachal Pradesh	.82	.64	.04	.79	.66
	(.02)	(.03)	(.004)	(.02)	(.04)
9. Jammu & Kashmir	.85	.75	.06	.82	.81
	(.03)	(.05)	(.003)	(.03)	(.04)
10. Karnataka	.75	.68	-.02	.79	.70
	(.03)	(.05)	(.003)	(.03)	(.04)
11. Kerala	.75	.76	.003	.75	.76
	(.02)	(.04)	(.002)	(.02)	(.04)
12. Maharashtra	.72	.37	-.005	.73	.37
	(.02)	(.03)	(.002)	(.02)	(.03)
13. Manipur	.67	.83	-.18	.60	.86
	(.03)	(.05)	(.02)	(.04)	(.06)
14. Meghalaya	.82	.90	-.05	.95	1.04
	(.05)	(.01)	(.01)	(.04)	(.05)
15. Mizoram	.53	.85	.01	.58	.76
	(.03)	(.08)	(.02)	(.03)	(.06)
16. Madhya Pradesh	.66	.49	-.03	.67	.50
	(.02)	(.03)	(.003)	(.02)	(.03)
17. Nagaland	.53	.75	-.05	.54	.74
	(.04)	(.06)	(.02)	(.04)	(.06)
18. Orissa	.84	.58	-.03	.88	.58
	(.02)	(.03)	(.01)	(.02)	(.03)
19. Punjab	.79	.79	.02	.77	.79
	(.02)	(.04)	(.002)	(.02)	(.03)
20. Rajasthan	.79	.70	.01	.79	.71
	(.01)	(.03)	(.004)	(.02)	(.03)
21. Sikkim	1.34	.66	.01	1.07	.65
	(.08)	(.05)	(.01)	(.06)	(.04)
22. Tamil Nadu	.58	.41	-.03	.63	.40
	(.02)	(.04)	(.002)	(.03)	(.04)
23. Tripura	.74	.65	-.004	.77	.66
	(.02)	(.04)	(.01)	(.03)	(.03)
24. Uttar Pradesh	.68	.71	.01	.68	.71
	(.01)	(.02)	(.002)	(.01)	(.02)
25. West Bengal	.76	.69	.02	.77	.69
	(.01)	(.02)	(.003)	(.02)	(.02)

[a] Standard errors in brackets.

Table 4: Estimates of Poverty and Land Deprivation (All Households)

State		Head Count Poverty Rate (% age)						Land Deprivation (% age)
		Cereal Ratio[a]		Official Poverty Line (OPL)[b]				
		BD1	BD2	OPL1	OPL2	OPL3	OPL4	LD
1.	Andhra Pradesh	2.5	20.8	13.9	9.8	23.4	27.2	53.7
2.	Arunachal Pradesh	14.9	57.1	29.9	21.9	40.3	40.0	37.4
3.	Assam	70.6	93.8	43.9	40.8	49.5	53.0	43.0
4.	Bihar	82.8	94.9	47.3	39.0	57.6	60.4	51.7
5.	Goa	0.0	0.7	5.5	4.8	8.9	7.5	56.2
6.	Gujarat	0.0	0.1	17.6	13.8	23.7	25.1	51.9
7.	Haryana	0.0	0.1	13.7	13.1	22.5	21.8	51.2
8.	Himachal Pradesh	0.7	5.1	15.0	13.8	26.6	25.3	40.7
9.	Jammu & Kashmir	1.0	8.8	9.3	7.7	13.7	15.1	36.0
10.	Karnataka	0.2	1.6	19.8	18.2	28.2	29.0	46.1
11.	Kerala	0.1	0.8	20.1	18.9	25.8	25.9	52.8
12.	Maharashtra	0.1	0.1	24.4	23.0	42.0	44.6	48.1
13.	Manipur	97.5	99.8	25.6	18.2	29.8	32.7	36.6
14.	Meghalaya	0.9	5.7	22.2	20.5	26.2	25.6	33.8
15.	Mizoram	17.0	61.7	8.1	3.8	8.3	10.0	23.4
16.	Madhya Pradesh	22.3	53.2	17.4	13.6	30.5	33.3	40.5
17.	Nagaland	11.1	44.6	2.0	1.5	3.5	4.1	14.3
18.	Orissa	69.8	83.7	34.9	30.5	47.9	50.0	45.7
19.	Punjab	0.0	0.0	8.2	6.6	11.9	12.2	57.8
20.	Rajasthan	0.1	1.6	12.4	9.9	20.1	20.9	46.1
21.	Sikkim	0.0	0.8	25.6	20.4	29.4	33.3	41.3
22.	Tamil Nadu	5.8	31.0	22.2	19.4	33.8	37.5	58.4
23.	Tripura	15.0	40.3	20.1	17.4	28.2	29.4	53.5
24.	Uttar Pradesh	12.0	32.5	26.7	19.6	33.8	36.1	43.8
25.	West Bengal	65.7	80.6	31.9	29.4	43.8	46.3	49.9

[a] BD1, BD2 correspond to $\hat{w}_{cereals} = 0.40, 0.35$ respectively.

[b] OPL1-OPL4 correspond to ρ, θ (estimated); ρ (estimated), $\theta = 1$; $\rho = 1$, $\theta = 1$; $\rho = 1$, θ (estimated), respectively.

Table 5: State Rankings Based on Poverty and on Land Deprivation

State		Head Count Poverty Rate (% age)						Land Deprivation (% age)
		Cereal Ratio[a]		Official Poverty Line (OPL)[b]				
		BD1	BD2	OPL1	OPL2	OPL3	OPL4	LD
1.	Andhra Pradesh	13	13	18	20	18	14	4
2.	Arunachal Pradesh	9	7	5	6	6	6	20
3.	Assam	3	3	2	1	2	2	16
4.	Bihar	2	2	1	2	1	1	8
5.	Goa	22	21	24	23	23	24	3
6.	Gujarat	21	24	15	15	17	18	7
7.	Haryana	23	23	19	18	19	19	9
8.	Himachal Pradesh	16	16	17	16	14	17	18
9.	Jammu & Kashmir	14	14	21	21	21	21	22
10.	Karnataka	17	18	14	13	13	13	12
11.	Kerala	19	20	13	11	16	15	6
12.	Maharashtra	20	22	9	5	5	5	11
13.	Manipur	1	1	8	12	10	11	21
14.	Meghalaya	15	15	10	7	15	16	23
15.	Mizoram	7	6	23	24	24	23	24
16.	Madhya Pradesh	6	8	16	17	9	10	19
17.	Nagaland	11	9	25	25	25	25	25
18.	Orissa	4	4	3	3	3	3	14
19.	Punjab	24	25	22	22	22	22	2
20.	Rajasthan	18	17	20	19	20	20	13
21.	Sikkim	25	19	7	8	11	9	17
22.	Tamil Nadu	12	12	11	10	8	7	1
23.	Tripura	8	10	12	14	12	12	5
24.	Uttar Pradesh	10	11	6	9	7	8	15
25.	West Bengal	5	5	4	4	4	4	10

[a] BD1, BD2 correspond to $\hat{w}_{cereals} = 0.40, 0.35$ respectively.

[b] OPL1-OPL4 correspond to ρ, θ (estimated); ρ (estimated), $\theta = 1$; $\rho = 1$, $\theta = 1$; $\rho = 1$, θ (estimated), respectively.

Table 6: Spearman Rank Correlation[a]

	BD1	BD2	OPL1	OPL2	OPL3	OPL4	LD
BD1	1.0 (-)	.97 (.05)	.50[c] (.17)	.38[c] (.18)	.54[c] (.17)	.53[c] (.17)	-.34[c] (.19)
BD2		1.00 (-)	.50[c] (.17)	.38[c] (.19)	.51[c] (.17)	.51[c] (.17)	-.42[c] (.18)
OPL1			1.00 (-)	.97 (.05)	.94 (.07)	.94 (.07)	-.01[c] (.20)
OPL2				1.00 (-)	.93 (.08)	.92 (.08)	.02[c] (.20)
OPL3					1.00 (-)	.99 (.03)	.05[c] (.20)
OPL3						1.00 (-)	.09[c] (.20)
LD							1.00 (-)

[a] Standard errors in brackets.
[b] Significantly different from unity at 5% level.
[c] Significantly different from unity at 1% level.

Table 7: Estimates of Poverty and Land Deprivation in SC/ST Households

State		Head Count Poverty Rate (% age)						Land Deprivation (% age)
		Cereal Ratio[a]		Official Poverty Line (OPL)[b]				
		BD1	BD2	OPL1	OPL2	OPL3	OPL4	LD
1.	Andhra Pradesh	4.7	36.1	24.6	18.1	37.2	45.4	64.7
2.	Arunachal Pradesh	16.3	57.7	31.1	23.6	41.3	41.1	31.1
3.	Assam	74.7	96.6	43.3	41.4	52.1	54.6	37.5
4.	Bihar	93.3	98.1	65.3	53.7	71.6	78.5	69.4
5.	Goa	0.0	0.0	0.0	0.0	0.0	0.0	66.7
6.	Gujarat	0.0	0.0	28.3	22.5	34.2	37.5	64.7
7.	Haryana	0.0	0.4	26.0	23.4	40.0	40.0	91.3
8.	Himachal Pradesh	1.7	8.8	22.5	20.4	35.7	37.0	54.0
9.	Jammu & Kashmir	1.7	14.5	14.5	12.0	20.1	22.6	55.6
10.	Karnataka	0.3	2.6	33.2	29.8	43.3	45.9	65.2
11.	Kerala	0.0	0.4	34.9	32.0	39.4	42.8	79.9
12.	Maharashtra	0.2	0.2	35.7	31.9	56.0	60.9	62.8
13.	Manipur	98.7	100.0	34.1	25.2	38.9	43.0	18.9
14.	Meghalaya	0.9	5.8	22.2	20.7	26.4	25.6	31.7
15.	Mizoram	17.2	61.5	8.2	3.9	8.4	10.1	22.8
16.	Madhya Pradesh	33.5	69.2	26.9	20.5	41.9	47.7	48.6
17.	Nagaland	11.4	45.7	2.0	1.6	3.4	4.3	12.5
18.	Orissa	82.6	92.4	49.7	43.6	61.8	66.1	53.0
19.	Punjab	0.0	0.0	17.6	14.0	24.6	25.1	95.0
20.	Rajasthan	0.4	3.4	22.4	17.3	32.7	35.7	60.0
21.	Sikkim	0.0	1.6	29.5	23.3	36.4	38.8	34.1
22.	Tamil Nadu	7.7	44.8	32.2	28.1	48.6	54.3	78.5
23.	Tripura	21.5	51.0	27.9	24.2	36.7	39.2	53.5
24.	Uttar Pradesh	22.7	51.2	44.2	33.1	49.7	55.9	68.4
25.	West Bengal	78.3	90.2	43.2	38.6	54.1	59.7	57.5

[a] BD1, BD2 correspond to $\hat{w}_{cereals} = 0.40, 0.35$ respectively.

[b] OPL1-OPL4 correspond to: ρ, θ (estimated); ρ (estimated), $\theta = 1$; $\rho = 1$, $\theta = 1$; $\rho = 1$, θ (estimated); respectively.

Table 8: Estimates of Poverty and Land Deprivation in Female Headed Households

State		Head Count Poverty Rate (% age)						Land Deprivation (% age)
		Cereal Ratio[a]		Official Poverty Line (OPL)[b]				
		BD1	BD2	OPL1	OPL2	OPL3	OPL4	LD
1.	Andhra Pradesh	11.3	46.6	37.1	15.9	23.1	57.3	72.0
2.	Arunachal Pradesh	32.9	76.7	54.8	16.4	30.1	64.4	34.2
3.	Assam	81.0	93.5	64.9	53.6	57.7	69.0	66.1
4.	Bihar	87.7	96.2	61.0	37.0	58.3	75.1	57.6
5.	Goa	0.0	2.9	14.7	8.8	11.8	20.6	64.7
6.	Gujarat	0.0	0.0	24.2	8.1	19.4	34.7	63.7
7.	Haryana	0.0	0.0	14.6	11.0	20.7	24.4	46.3
8.	Himachal Pradesh	0.8	4.9	12.8	8.2	19.1	24.0	39.8
9.	Jammu & Kashmir	0.0	9.5	9.5	6.7	11.4	14.3	41.0
10.	Karnataka	0.6	3.1	28.9	20.4	28.3	39.9	60.1
11.	Kerala	0.5	2.5	24.2	20.5	27.3	30.1	50.4
12.	Maharashtra	0.0	0.2	31.6	20.7	34.6	55.3	59.4
13.	Manipur	95.1	100.0	32.1	12.3	21.0	37.0	51.9
14.	Meghalaya	0.5	1.9	13.9	12.0	14.4	15.8	35.4
15.	Mizoram	20.0	65.0	5.0	0.0	5.0	7.5	30.0
16.	Madhya Pradesh	42.7	67.1	38.0	18.3	29.8	55.3	52.9
17.	Nagaland	36.8	78.9	10.5	0.0	0.0	10.5	10.5
18.	Orissa	67.1	81.7	34.9	24.1	37.6	55.6	51.2
19.	Punjab	0.0	0.0	8.9	5.2	8.9	11.9	70.4
20.	Rajasthan	0.4	3.4	21.1	10.8	21.1	31.9	51.7
21.	Sikkim	0.0	0.0	19.2	19.2	23.1	30.8	23.1
22.	Tamil Nadu	18.1	50.8	42.7	25.6	36.8	59.8	67.0
23.	Tripura	42.0	63.9	47.9	30.3	37.0	58.0	62.2
24.	Uttar Pradesh	24.0	46.6	41.6	22.6	37.7	52.5	52.8
25.	West Bengal	75.0	84.8	49.1	36.3	46.0	61.9	57.9

[a] BD1, BD2 correspond to $\hat{w}_{cereals} = 0.40, 0.35$ respectively.

[b] OPL1-OPL4 correspond to: ρ, θ (estimated); ρ (estimated), $\theta = 1$; $\rho = 1$, $\theta = 1$; $\rho = 1$, θ (estimated); respectively.

FIG. 1

Poverty Estimates in Selected States for Aggregate Population and Subgroups (SC/ST,FHH)

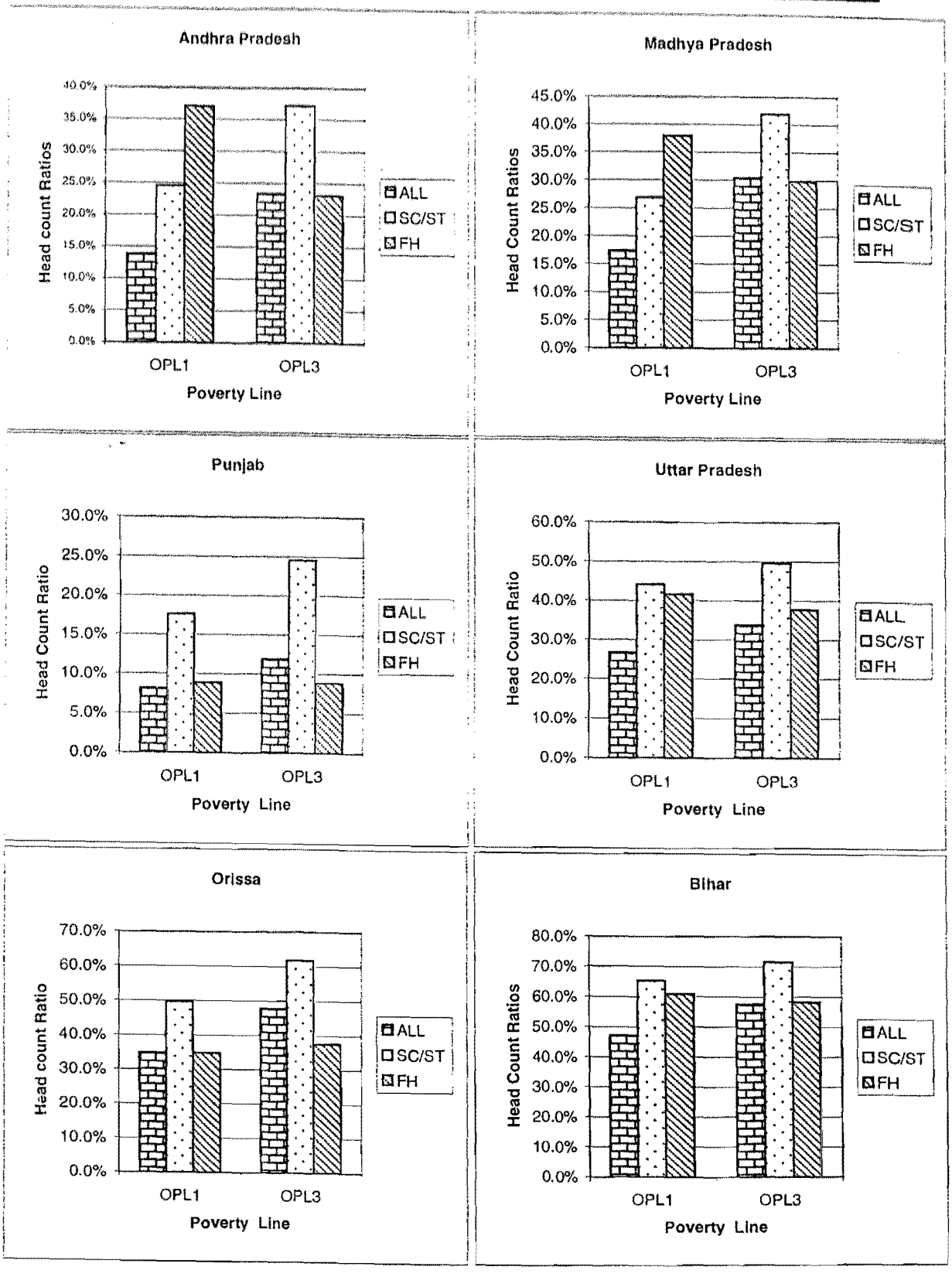
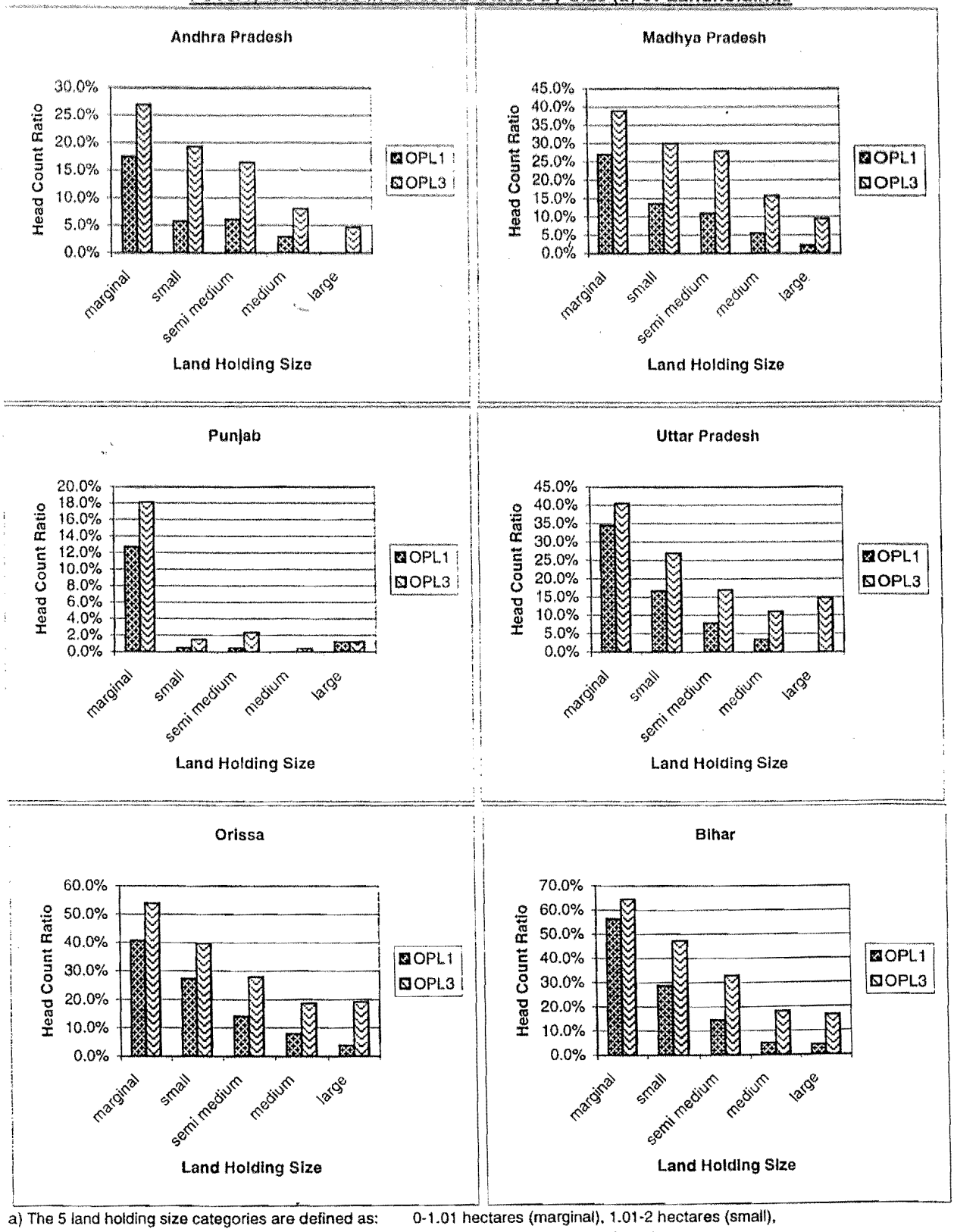


FIG. 2

Poverty Estimates in Selected States by Size (a) of Landholdings



a) The 5 land holding size categories are defined as: 0-1.01 hectares (marginal), 1.01-2 hectares (small), 2-4 hectares (semi medium), 4-10 hectares (medium), and greater than ten hectares (large)

Table 9: Logit Estimates[a] of a Rural Household's Poverty Status Variable, P[b] on Selected Characteristics

Variable	Coefficient Estimate[c]	Variable	Coefficient Estimate[c]
Constant	-23.95[e] (.76)		
Household Characteristics		State Level Characteristics	
No. of Adults	5.11[e] (.64)	Price Level	1420.60[e] (32.59)
No. of Children	41.50[e] (.62)	Per Capita State Domestic Product at 1991/92 Prices	-.02[e] (.001)
SC/ST (1 = yes, 0 = no)	76.64[e] (1.94)	Female Life Expectancy	7.26[e] (.92)
FHH (1 = yes, 0 = no)	17.84[e] (3.16)	Infant Mortality	4.14[e] (.18)
Size of Landholdings	-24.03[e] (.81)	Proportion of Children in Age Group 5 – 9 Years that Attend School	-.54[e] (.12)
		Proportion of Children in Age Group 10-14 Years that Attend School	-2.32[e] (.21)
		Female Labour Participation Rate	9.08[e] (.28)
		Per Capita Supply of Food Grains through Public Distribution	-7.65[e] (.28)
		Proportion of Households Receiving Subsidised Food Grains	2.91[e] (.17)
		Proportion of Households with Access to Safe Water	-.34[d] (.15)
		Total Number of Observations	61,835
		Cragg-Uhler R^2	0.220
		McFadden R^2 (adjusted for degrees of freedom)	0.132

[a] Standard Errors in Brackets.
[b] P = 1, if household is below the poverty line (as defined by OPL1), 0, otherwise.
[c] All the coefficient estimates, ie. excluding the constant, and their standard errors have been multiplied by 100.
[d] Significant at 5% level.
[e] Significant at 1% level.

References:

Buhmann, B., Rainwater, L., Schmaus, G. and T. Smeeding (1988), "Equivalence Scales, Well-Being, Inequality and Poverty: Sensitivity Across Ten Countries Using the Luxembourg Income Study (LIS) Database", *Review of Income and Wealth*, 94, 115-142.

Buvinic, M. and G.R. Gupta (1997), "Female-Headed Households and Female-Maintained Families: Are They Worth Targeting to Reduce Poverty in Developing Countries?", *Economic Development and Cultural Change*, 45(2), 259-280.

Chaudhuri, S. and M. Ravallion (1994), "How Well Do Static Indicators Identify the Chronically Poor?", *Journal of Public Economics*, 53, 367-394.

Coulter, F.A.E., Cowell, F.A. and S.P. Jenkins (1992), "Equivalence Scale Relativities and the Extent of Inequality and Poverty", *Economic Journal*, 102, 1067-82.

Datt, G. and M. Ravallion (1998), "Why Have Some Indian States Done Better Than Others at Reducing Rural Poverty?", *Economica*, 65, 17-38.

Dreze, J. and A. Sen (1995), *India Economic Development and Social Opportunity*, Clarendon Press, Oxford.

Dreze, J. and P.V. Srinivasan (1996), "Poverty in India: Regional Estimates 1987-88", *Discussion Paper No. 70, London School of Economics – STICERD*, February.

Dreze, J. and P.V. Srinivasan (1997), "Widowhood and Poverty in Rural India: Some Inferences from Household Survey Data", *Journal of Development Economics*, 54(2), 217-234.

Dubey, A. and S. Gangopadhyay (1998), *Counting the Poor: Where Are the Poor in India?*, Sarvekshana, Analytical Report Number 1, Department of Statistics, Government of India.

Galbraith, J.K. (1979), *The Nature of Mass Poverty*, Harvard University Press, Cambridge, Massachusetts.

Lancaster, G., Ray, R. and R. Valenzuela (1999), "A Cross Country Study of Household Poverty and Inequality on Unit Record Household Budget Data", forthcoming in *Economic Development and Cultural Change.*

Lanjouw, P. and M. Ravallion (1995), "Poverty and Household Size", *Economic Journal*, 105, 1415-1434.

Meenakshi, J.V. and R. Ray (1999), "Regional Differences in India's Food Expenditure Pattern: A Complete Demand Systems Approach", *Journal of International Development*, 11, 47-74.

Minhas, B.S., Jain, L.R., Kansal, S.M. and M.R. Saluja (1990), "Rural Cost of Living: 1970-71 to 1983, States and All India", *Indian Economic Review*, 25(1), 75-104.

Nelson, J.A. (1988), "Household Economies of Scale in Consumption: Theory and Evidence", *Econometrica*, 56, 1310-1314.

Nolan, B. and C.T. Whelan (1996), *Resources Deprivation and Poverty*, Clarendon Press, Oxford.

Rao, V.V. (1981), "Measurement of Deprivation and Poverty Based on the Proportion Spent on Food", *World Development*, 9(4), 337-353.

Ringen, S. (1991), "Households, Standard of Living, and Inequality", *Review of Income and Wealth*, 37(1), 1-13.

CENTRE FOR DEVELOPMENT ECONOMICS
WORKING PAPER SERIES

No.	Author(s)	Title
1	Kaushik Basu Arghya Ghosh Tridip Ray	The Babu and The Boxwallah : Managerial Incentives and Government Intervention (January 1994). Review of Development Economics, 1997
2	M.N. Murty Ranjan Ray	Optimal Taxation and Resource Transfers in a Federal Nation (February 1994)
3	V. Bhaskar Mushtaq Khan	Privatization and Employment : A Study of The Jute Industry in Bangladesh (March 1994). American Economic Review, March 1995, pp. 267-273
4	V. Bhaskar	Distributive Justice and The Control of Global Warming (March 1994) The North, the South and the Environment: V. Bhaskar and Andrew Glyn (Ed.) Earthscan Publication London, February 1995
5	Bishnupriya Gupta	The Great Depression and Brazil's Capital Goods Sector: A Re-examination (April 1994). Revista Brasileria de Economia 1997
6	Kaushik Basu	Where There Is No Economist: Some Institutional and Legal Prerequisites of Economic Reform in India (May 1994)
7	Partha Sen	An Example of Welfare Reducing Tariff Under Monopolistic Competition (May 1994), Reveiw of International Economics, (forthcoming)
8	Partha Sen	Environmental Policies and North-South Trade : A Selected Survey of the Issues (May 1994)
9	Partha Sen Arghya Ghosh Abheek Barman	The Possibility of Welfare Gains with Capital Inflows in A Small Tariff-Ridden Economy (June 1994)
10	V. Bhaskar	Sustaining Inter-Generational Altruism when Social Memory is Bounded (June 1994)
11	V. Bhaskar	Repeated Games with Almost Perfect Monitoring by Privately Observed Signals (June 1994)

No.	Author(s)	Title
12	S. Nandeibam	Coalitional Power Structure in Stochastic Social Choice Functions with An Unrestricted Preference Domain (June 1994). Journal of Economic Theory (Vol. 68 No. 1, January 1996, pp. 212-233
13	Kaushik Basu	The Axiomatic Structure of Knowledge And Perception (July 1994)
14	Kaushik Basu	Bargaining with Set-Valued Disagreement (July 1994). Social Choice and Welfare, 1996, (Vol. 13, pp. 61-74)
15	S. Nandeibam	A Note on Randomized Social Choice and Random Dictatorships (July 1994). Journal of Economic Theory, Vol. 66, No. 2, August 1995, pp. 581-589
16	Mrinal Datta Chaudhuri	Labour Markets As Social Institutions in India (July 1994)
17	S. Nandeibam	Moral Hazard in a Principal-Agent(s) Team (July 1994) Economic Design Vol. 1, 1995, pp. 227-250
18	D. Jayaraj S. Subramanian	Caste Discrimination in the Distribution of Consumption Expenditure in India: Theory and Evidence (August 1994)
19	K. Ghosh Dastidar	Debt Financing with Limited Liability and Quantity Competition (August 1994)
20	Kaushik Basu	Industrial Organization Theory and Developing Economies (August 1994). Indian Industry: Policies and Performance, D. Mookherjee (ed.), Oxford University Press, 1995
21	Partha Sen	Immiserizing Growth in a Model of Trade with Monopolisitic Competition (August 1994). The Review of International Economics, (forthcoming)
22	K. Ghosh Dastidar	Comparing Cournot and Bertrand in a Homogeneous Product Market (September 1994)
23	K. Sundaram S.D. Tendulkar	On Measuring Shelter Deprivation in India (September 1994)
24	Sunil Kanwar	Are Production Risk and Labour Market Risk Covariant? (October 1994)

No.	Author(s)	Title
25	Partha Sen	Welfare-Improving Debt Policy Under Monopolistic Competition (November 1994)
26	Ranjan Ray	The Reform and Design of Commodity Taxes in the presence of Tax Evasion with Illustrative Evidence from India (December 1994)
27	Wietze Lise	Preservation of the Commons by Pooling Resources, Modelled as a Repeated Game (January 1995)
28	Jean Drèze Anne-C. Guio Mamta Murthi	Demographic Outcomes, Economic Development and Women's Agency (May 1995). Population and Development Review, December, 1995
29	Jean Drèze Jackie Loh	Literacy in India and China (May 1995). Economic and Political Weekly, 1995
30	Partha Sen	Fiscal Policy in a Dynamic Open-Economy New-Keynesian Model (June 1995)
31	S.J. Turnovsky Partha Sen	Investment in a Two-Sector Dependent Economy (June 1995). The Journal of Japanese and International Economics, Vol. 9, No. 1, March 1995
32	K. Krishnamurty V. Pandit	India's Trade Flows: Alternative Policy Scenarios: 1995-2000 (June 1995). Indian Economic Review, Vol. 31, No. 1, 1996
33	Jean Drèze P.V. Srinivasan	Widowhood and Poverty in Rural India: Some Inferences from Household Survey Data (July 1995). Journal of Development Economics, 1997
34	Ajit Mishra	Hierarchies, Incentives and Collusion in a Model of Enforcement (January 1996)
35	Sunil Kanwar	Does the Dog wag the Tail or the Tail the Dog? Cointegration of Indian Agriculture with Non-Agriculture (February 1996)
36	Jean Drèze P.V. Srinivasan	Poverty in India: Regional Estimates, 1987-8 (February 1996)
37	Sunil Kanwar	The Demand for Labour in Risky Agriculture (April 1996)
38	Partha Sen	Dynamic Efficiency in a Two-Sector Overlapping Generations Model (May 1996)

No.	Author(s)	Title
39	Partha Sen	Asset Bubbles in a Monopolistic Competitive Macro Model (June 1996)
40	Pami Dua Stephen M. Miller David J. Smyth	Using Leading Indicators to Forecast US Home Sales in a Bayesian VAR Framework (October 1996)
41	Pami Dua David J. Smyth	The Determinants of Consumers' Perceptions of Buying Conditions for Houses (November 1996)
42	Aditya Bhattacharjea	Optimal Taxation of a Foreign Monopolist with Unknown Costs (January 1997)
43	M. Datta-Chaudhuri	Legacies of the Independence Movement to the Political Economy of Independent India (April 1997)
44	Suresh D. Tendulkar T. A. Bhavani	Policy on Modern Small Scale Industries: A Case of Government Failure (May 1997)
45	Partha Sen	Terms of Trade and Welfare for a Developing Economy with an Imperfectly Competitive Sector (May 1997)
46	Partha Sen	Tariffs and Welfare in an Imperfectly Competitive Overlapping Generations Model (June 1997)
47	Pami Dua Roy Batchelor	Consumer Confidence and the Probability of Recession: A Markov Switching Model (July 1997)
48	V. Pandit B. Mukherji	Prices. Profits and Resource Mobilisation in a Capacity Constrained Mixed Economy (August 1997)
49	Ashwini Deshpande	Loan Pushing and Triadic Relations (September 1997)
50	Rinki Sarkar	Depicting the Cost Structure of an Urban Bus Transit Firm (September 1997)
51	Sudhir A. Shah	Existence and Optimality of Mediation Schemes for Games with Communication (November 1997)
52	V. Pandit	A Note on Data Relating to Prices in India (November 1997)
53	Rinki Sarkar	Cost Function Analysis for Transportation Modes: A Survey of Selective Literature (December 1997)

No.	Author(s)	Title
54	Rinki Sarkar	Economic Characteristics of the Urban Bus Transit Industry: A Comparative Analysis of Three Regulated Metropolitan Bus Corporations in India (February 1998)
55	Aditya Bhattacharjea	Was Alexander Hamilton Right? Limit-pricing Foreign Monopoly and Infant-industry Protection (February 1998)
56	Bishwanath Goldar Badal Mukherji	Pollution Abatement Cost Function: Methodological and Estimation Issues (March 1998)
57	Smita Misra	Economies of Scale in Water Pollution Abatement: A Case of Small-Scale Factories in an Industrial Estate in India (April 1998)
58	T.A. Bhavani Suresh D. Tendulkar	Determinants of Firm-level Export Performance: A Case Study of Indian Textile Garments and Apparel Industry (May 1998)
59	Partha Sen	Non-Uniqueness In The First Generation Balance of Payments Crisis Models (December 1998)
60	Ranjan Ray J.V. Meenakshi	State-Level Food Demand in India: Some Evidence on Rank-Three Demand Systems (December 1998)
61	Brinda Viswanathan	Structural Breaks in Consumption Patterns: India, 1952-1991 (December 1998)
62	Pami Dua Aneesa I. Rashid	Foreign Direct Investment and Economic Activity in India (March 1999)
63	Pami Dua Tapas Mishra	Presence of Persistence in Industrial Production : The Case of India (April 1999)
64	Sumit Joshi Sanjeev Goyal	Collaboration and Competition in Networks (May 1999)
65	Abhijit Banerji	Sequencing Strategically: Wage Negotiations Under Oligopoly (May 1999)
66	Jean Dreze Reetika Khera	Crime, Gender and Society in India : Some Clues from Homicide Data (June 1999)
67	Sumit Joshi	The Stochastic Turnpike Property without Uniformity in Convex Aggregate Growth Models (June 1999)

No.	Author(s)	Title
68	J.V. Meenakshi Ranjan Ray	Impact of Household Size, Family Composition and Socio Economic Characteristics on Poverty in Rural India (July 1999)

No.	Author(s)	Title
54	Rinki Sarkar	Economic Characteristics of the Urban Bus Transit Industry: A Comparative Analysis of Three Regulated Metropolitan Bus Corporations in India (February 1998)
55	Aditya Bhattacharjea	Was Alexander Hamilton Right? Limit-pricing Foreign Monopoly and Infant-industry Protection (February 1998)
56	Bishwanath Goldar Badal Mukherji	Pollution Abatement Cost Function: Methodological and Estimation Issues (March 1998)
57	Smita Misra	Economies of Scale in Water Pollution Abatement: A Case of Small-Scale Factories in an Industrial Estate in India (April 1998)
58	T.A. Bhavani Suresh D. Tendulkar	Determinants of Firm-level Export Performance: A Case Study of Indian Textile Garments and Apparel Industry (May 1998)
59	Partha Sen	Non-Uniqueness In The First Generation Balance of Payments Crisis Models (December 1998)
60	Ranjan Ray J.V. Meenakshi	State-Level Food Demand in India: Some Evidence on Rank-Three Demand Systems (December 1998)
61	Brinda Viswanathan	Structural Breaks in Consumption Patterns: India, 1952-1991 (December 1998)
62	Pami Dua Aneesa I. Rashid	Foreign Direct Investment and Economic Activity in India (March 1999)
63	Pami Dua Tapas Mishra	Presence of Persistence in Industrial Production : The Case of India (April 1999)
64	Sumit Joshi Sanjeev Goyal	Collaboration and Competition in Networks (May 1999)
65	Abhijit Banerji	Sequencing Strategically: Wage Negotiations Under Oligopoly (May 1999)
66	Jean Dreze Reetika Khera	Crime, Gender and Society in India : Some Clues from Homicide Data (June 1999)
67	Sumit Joshi	The Stochastic Turnpike Property without Uniformity in Convex Aggregate Growth Models (June 1999)