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A CROSS SECTIONAL ANALYSIS OF POVERTY
AND UNDERNUTRITION IN RURAL INDIA

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Poverty in an area is generally characterised by low level of income or low level of consumption of either the whole population or a part of the population. Poverty is therefore because of either average income or the distribution of income or of both. Even if asset and income are equally distributed among the members of a society, that society may turn out to be poor if average income is very low so that all are equally poor. On the other hand even if average income of a society is quite high, majority of people may be living in poverty if distribution of income is highly skewed in favour of few persons. Poverty in Indian context has generally been viewed in terms of minimum level of survival which again has been formulated in terms of minimum requirement of calorie intake. Centre for Development Studies (CDS)^{1/} and Panikar^{2/} have already studied the variation in percapita intake of calorie in different states. Just as average income does not necessarily explain the poverty of a society, average intake of calorie too does not say much about the incidence of undernutrition. We, therefore intend to make an analysis to identify variables which influence the consumption expenditure or calorie intake of poor people. In otherwords we

1/ Centre for Development Studies (CDS), Poverty, Unemployment and Development Policy - A Case Study of Selected issues with reference to Kerala, Orient Longman, 1977.

2/ Panikar P.G.K. "Interregional variations in Calorie intake" Working Paper No. 111, Centre for Development Studies, Trivandrum, 1980.

would in this exercise like to find out causes of poverty and undernutrition. We would however restrict our analysis to rural areas only.

Asset distribution or land inequality in rural areas has been argued as most important reason of poverty. CDS ^{3/} has shown that negative correlation exists between land inequality and average intake of either cereals or calories. Land inequality, however, may cause absolute poverty also. If land is concentrated in few hands, wage rate which gives income to poor people may go down. This happens because as there is more landless people, they will offer themselves as agricultural labourers to few land owners. They will thus compete for work decreasing the wage rate in the process. If poor people do not have other assets and sources of income, land inequality and wage rate may determine poverty. If there are however other than agricultural activities which generate employment among poor people, and raise total income, land distribution may not be crucial variable to explain poverty. CDS ^{4/} however found a negative correlation between per capita agricultural income and per capita cereals intake or calories intake. This might have happened because nominal income instead of real income was considered there. Panikar ^{5/} on the contrary obtained a positive correlation between calories intake and

^{3/} Centre for Development Studies, op.cit.

^{4/} Ibid

^{5/} Panikar, P.G.K. op.cit.

consumer expenditure. As increase in overall real income is likely to increase the purchasing power of poor people also, we expect poverty to be less where real income is more. This however depends upon the fact how the income has been generated. If income is generated by few persons through labour saving devices poverty may not be eradicated or even reduced by raising real income.

Unemployment is therefore, another variable, which we think causes poverty. Visaria^{6/} maintains a clear association between poverty and unemployment. As he finds involuntary unemployment more in lower income classes, it is expected that poverty is more where unemployment is high. Poor are after all supposed to be benefited by employment what gives them income. Dependence of landless people on agriculture is another reason of poverty, we suppose. If there is more non agricultural activity, supply of labour to agricultural activities will go down, and consequently wage rate will go up. New products will create new markets, and in the process it will bring development through overall increase in production or real income benefiting all classes. Finally, demographic pressure seems to be one of the major causes of poverty in India. In the absence of unlimited production potential, per capita income tends to be lower if population pressure is higher. Also, burden of this reduction is borne more than proportionately by poor people. As labour supply increases, wage rate tends to reduce which increases Poverty.

6/ Visaria, Pravin " Poverty and Unemployment In India" Indian Journal of Agricultural Economics, July-September, 1980.

So far we were discussing poverty in terms of income. Another index of poverty may be discussed in terms of nutritional intake. We can apply the above arguments to analyse either the average intake of nutrients or intake of nutrients among undernourished people who are generally poor people. The incidence of undernutrition depends not only upon above economic variables, but also on consumption behaviour. Protein-calorie malnutrition affecting mainly the children belonging to poverty groups is more prevalent in rice eating belts of the country.^{7/}

We have therefore in above discussion tried to put forward that variables like employment rate, wage rate, density of population, distribution of land, industrialisation, or dependence on agriculture along with production level determine the poverty. And these variables along with consumption pattern determine incidence of undernutrition also.

We have not so far defined poverty or undernutrition in quantitative terms so that we can test our arguments. Without going into details about debate of measurement and properties of different social welfare functions, we can safely assume that Sen's poverty index $P^8/$ is the best measurement of poverty. This takes care of (i) head-count

^{7/} Gopalan, C. and Vijay Raghavan, K. Nutrition Atlas of India, National Institute of Nutrition, ICMR, 1971.

^{8/} Sen, A "Poverty, inequality and unemployment: some conceptual issues in measurement" in Poverty and income distribution in India (ed). P.K. Bardhan and T.N. Srinivasan, Statistical Publishing Society, 1974.

ratio of people below a certain minimum level of living (or poverty line), (ii) distribution of income within the people of poor group, and (iii) gap of income of each member of poor group from the poverty line. And to measure undernutrition we will use index of undernutrition u given in Dasgupta^{9/} which is similar to Sen's index P except for the fact that instead of poverty line and expenditures in monetary terms, we use minimum level and intakes in calorie units. 'U' for grouped data has been formulated as follows:

$$U = \frac{2}{Z(q + 1/n)} \sum_{i=1}^L W_i(z - y_i) \left(q - \bar{W}_i/2 + w_i/2 + n/2 \right)$$

where,

- Y_i += per capita intake of calories of i th class,
 Z = Minimum level of calorie requirement,
 w_i = the proportion of population upto and including the i th class,
 \bar{W}_i = cumulative proportion of population upto and including the i th class,
 L = the number of classes below the level of z
 q = proportion of people below the level of z ,
and n = population size.

We have in this exercise with interstate data through regression analysis tried to investigate which of the above variables are in fact responsible for interstate variations in poverty and undernutrition in rural areas. Sen's index P for different rates (rural areas) has been given in Ahluwalia.^{10/}

9/ Dasgupta, Rajaram "Nutritional inequality in India" paper presented to 37th annual conference of Indian society of Agricultural Economics, Delhi, 1977.

10/ Ahluwalia, Montek S. "Rural poverty in India 1956-57 to 1973-74" World Bank Staff Working Paper 279, May 1978.

Index of undernutrition U described earlier has been taken from Dasgupta.^{11/} Inequality of land distribution measured by Lorentz ratio L has been given in Mukherjee.^{12/} Although, it is for the year 1971-72, we don't think this value changes much in a short period of two to three years. Other measures of land distribution are proportion of landless households and proportion of households with holdings of one acre or less given in Sinha^{13/} collected from All India Rural Debt and Investment Survey by Reserve Bank of India. Unemployment rates have been taken from 25th round of NSS surveys (No.255 and No.270) for the year 1970-71 and 1972-73. Money wage rates too have been taken from NSS 25th round data which is again for the year 1970-71. To remove the price effect or in other words to convert it into real wage we have used interstate (rural) price indices computed by Bhattacharya.^{14/} This interstate price indices are however for the year 1961-62. In the absence of any other series for rural areas, our tacit assumption in this exercise therefore is that interstate price variations in rural areas in seventies are same as what were in sixties. Per capita state domestic product

^{11/} Dasgupta, Rajaram op.cit.

^{12/} Mukherjee, Chandan and Sujana Bai, "Lorentz ratios for distribution of rural ownership and operational land holdings, India 1971-72" Working Paper 94, Centre for Development Studies, Trivandrum, 1979.

^{13/} Sinha, J.N. "Rural employment planning-Dimensions and constraints" Economic and Political Weekly, Annual Number, 1978.

^{14/} Bhattacharya N. and Chatterjee G.S. "Between states variation in consumer prices and per capita household consumption in rural India" in Poverty and income distribution in India. op.cit.

(SDP) has been taken from RBI bulletin, ^{15/} Rural per capita SDP has been computed considering SDP's from agriculture and animal husbandry, and rural population. They have again been deflated by interstate price indices mentioned earlier to arrive at real per capita rural income. As SDP's are given in 1961-62 price, use of rural interstate price indices given by Bhattacharya ^{16/} do not pose problems as in the case of deflating wage rates. Density of population has been taken from Statistical Abstract. Share of agricultural labourers in total workers in rural areas in 1971 has been taken from Sinha ^{17/} where it has been collected from census papers.

We have given the results of linear regression equations in Table 2 where Sen's poverty index P is the dependent variable. Equations (1) to (12) contain only one explanatory variable in each equation whereas (13) to (18) are multiple regressions. Both density of population and unemployment rate appear to be significant variable to explain interstate poverty differences. Co-efficients of all three kinds of unemployment rates male, female and total are significant. Another interesting significant variable determining poverty is share of agricultural labourers ^{to total rural workers.} Share of agricultural labourers and poverty have been found to be positively correlated. This lends support to our earlier

^{15/} Reserve Bank of India, Reserve Bank of India Bulletin, Bombay, April 1978.

^{16/} Bhattacharaya, N. and Chatterjee, G.S. op.cit.

^{17/} Sinha, J.N. op cit.

hypothesis that non-agricultural activities generate employment, reduces supply of labour to agricultural activity thus increasing wage rate, and at the process increases total production by creating new markets, and finally reduces poverty. Real wage rate in equations (11) and (12) too show proper sign although significant at 10 and 15 percent probability levels only.

We have however failed to establish that inequality in land-holdings has been one of the causes of absolute poverty. We in fact find reverse signs in equations (6), (7) and (8) although none of the co-efficients are significant. Lorentz ratio of land-holdings without being significant however show a proper sign in multiple regression equation (13). It therefore requires much more detailed study to establish the relationship between poverty and land distribution. We should note that 1 acre of land in dry region and 1 acre of land in wet region are not same so far as generation of income is considered. Negative result only shows that there are other factors which also cause poverty. Rural real percapita SDP both in simple regression equation (10) and multiple regression equation (13) appears to be significant variable to determine poverty. Regression result lands support to our other hypothesis also that demographic pressure is also one of the causes of poverty.

In table 3 we have regression results with index of under-nutrition as the dependent variable. Here also we find that under-nutrition depends upon unemployment rate and rural real percapita income. CDS^{18/} showed that per capita calorie intake increases with the

^{18/} Centre for Development Studies, op.cit.

Table 1: List of variables considered in our exercise

| Variable Number | Variable Description | Variable name |
|-----------------|---|---------------|
| 1 | Sen's Poverty index 1973-74 | P |
| 2 | Index of Undernutrition 1971-72 | U |
| 3 | Unemployment rate, Male 1972-73 | UM |
| 4 | Unemployment rate Female 1972-73 | UF |
| 5 | Unemployment rate, Total 1972-73 | UT |
| 6 | Unemployment rate, Male 1970-71 | MI |
| 7 | Realwage rate, Male 1970-71 | WM |
| 8 | Realwage rate, Female 1970-71 | WF |
| 9 | Share of agricultural labourers 1971 | SA |
| 10 | Proportion of landless households 1971-72 | PL |
| 11 | Proportion of household with holding of 1 acre or less 1971-72 | PH |
| 12 | Per capita output of total cereals 1971-72 | OC |
| 13 | Lorenz ratio of land ownership 1971-72 | L |
| 14 | Density of population 1971-72 | DP |
| 15 | Rural real per capita SDP 1971-72 | RP |
| 16 | Per capita consumption of rice 1970-71 | CR |
| 17 | Per capita consumption of Wheat 1970-71 | CW |
| 18 | Per capita consumption of other cereals 1970-71 | CO |

Table 2 contd...

| Equation Number | Constant term | 3 UM | 4 UF | 5 UT | 7 WM | 8 WF |
|-----------------|-----------------|----------------|----------------|-----------------|------------------|------------------|
| 11 | .2606 (1.64) | - | - | - | -.04 (1.49) | - |
| 12 | .32 (2.15)* | - | - | - | - | .077 (1.95)** |
| 13 | .1109 (1.70) | .003 (.703) | - | - | - | - |
| 14 | .05 (1.01) | .003 (.57) | - | - | -.019 (1.17) | - |
| 15 | .026 (.49) | .003 (.49) | - | - | - | -.011 (.371) |
| 16 | .047 (1.06) | - | .005 (1.57) | - | -.0085 (.508) | - |
| 17 | .05 (1.04) | - | - | .0033 (.794) | -.013 (1.83) | - |
| 18 | .026 (.49) | - | - | .004 (.826) | .0226 (.726) | - |

+ Figures in parenthesis are T values

* Significant at 5 percent level

** Significant at 10 percent level

Cols. contd...

Table 2 Contd..

| Equation Number | 9 SA | 10 PL | 11 PH | 12 OC | 13 T | 14 DP | 15 RP | R ² |
|--------------------|-------------------------|----------|----------|----------|------------------|-------------------------|------------------|----------------|
| 11 | - | - | - | - | - | - | - | .68 |
| 12 | - | - | - | - | - | - | - | .17 |
| 13 | .002 (1.46) | - | - | - | .0092 (.1313) | .0002 (1.43) | .0005 (2.39)* | .70 |
| 14 | (1.99) ³ *** | - | - | - | - | (1.81) ³ *** | - | .61 |
| 15 | .003 (1.86)** | - | - | - | - | .0002 (1.25) | - | .57 |
| 16 | .0013 (.79) | - | - | - | - | .0002 (1.43) | - | .68 |
| 17 | .002 (1.48)*** | - | - | - | - | .0003 (1.64)*** | - | .62 |
| 18 | .003 (1.51)*** | - | - | - | - | .0002 (.123) | - | .59 |

+ Figures in parenthesis are T values

** Significant at 10 percent level

*** Significant at 15 percent level.

* Significant at 5 percent level

Table 3: Linear regression results with Index of undernutrition
(u) as dependent variable^a

| Constant term | 6 | 7 | 8 | 12 | 15 | 16 | 17 | 18 | R ² |
|---------------|------------------|-----------------|-----------------|------------------|-------------------|-------------------|------------------|-------------------|----------------|
| | UMI | WM | WF | OC | RP | CR | CW | CO | |
| 1 | .163 (.918) | - | - | - | - | - | - | - | .34 |
| 2 | .197 (1.149) | -.028 (1.15) | - | - | - | - | - | - | .02 |
| 3 | .234 (1.42) | - | -.069 (1.38) | - | - | - | - | - | .06 |
| 4 | .247 (2.05)* | - | - | -.663 (3.51)* | - | - | - | - | .43 |
| 5 | .269 (1.77)** | - | - | - | -.0008 (2.14)* | - | - | - | .20 |
| 6 | .0775 (.297) | - | - | - | - | .006 (1.59)*** | - | - | .09 |
| 7 | .171 (1.32) | - | - | - | - | - | -.018 (4.06)* | - | .51 |
| 8 | 1.63 (.918) | - | - | - | - | - | - | -.008 (1.73)** | .12 |

a) Figures in parenthesis are T values

* Significant at 5 percent level

** Significant at 10 percent level

*** Significant at 15 percent level

increase in foodgrains production. Our result rather goes beyond it showing that output of cereals and index of undernutrition are negatively correlated which indicates that benefit of increase in cereals production percolates to poorer sections even. More interestingly undernutrition depends upon consumption pattern also. Whereas rice consumption is positively correlated with undernutrition, consumption of wheat and other cereals are negatively correlated with undernutrition. Beta co-efficient of wheat consumption is highly significant even. Panikar^{19/} has already shown that average intake of calorie is higher in wheat belts.

What we would therefore like to conclude from the above results is that there is no single cause of poverty. As we couldn't establish the causal effect of land distribution on poverty we could not put it forward for the time being. Real percapita income including cereals production has to be increased. But this will not reduce poverty unless unemployment is reduced. In other words we can perhaps conclude that reduction of poverty not necessarily lies in the process of land redistribution but it may be achieved through employment generation schemes preferably in non-agricultural activity so that by creating new markets this will induce to raise agricultural production and also per capita income. This will take care of distributional aspects also. Another important point which emerges through the above exercise is that consumption pattern and consequently production pattern should be changed in favour of wheat and coarse cereals. It has to be noted that as density of

^{19/} Paniker, P.G.K. op.cit.

population has been one of the reasons of poverty, population growth has to be checked in future. It is however a different question whether population growth will automatically stop in the long run through over all development or it has to be checked by family planning programme.



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