Revised on 29January, 2010

Targeting Accuracy of the NREG:[1]

Evidence from Rajasthan, Andhra Pradesh and Maharashtra

by

Raghav Gaiha, Shylashri Shankar and Raghbendra Jha[2]

[2] Shankar: Centre for Policy Research, New Delhi (email: shylashris@gmail.com).Gaiha: University of Delhi, Delhi. Jha: ASARC, Arndt-Corden Division of Economics, The Australian National University, Canberra (email: r.jha@anu.edu.au).

Abstract

Several tests of targeting accuracy of the National Rural Employment Guarantee Scheme (NREG) focusing on shares of participants by poverty status, their duration of participation, and earnings from it are used. The analysis is based on primary household data collected from three India states, Rajasthan, Andhra Pradesh and Maharashtra. In all three states, the poor depended more on the NREG than the non-poor, with the share of NREGS earnings in household income of the poor being the highest in Andhra Pradesh. Useful insights into the design and implementation of this scheme that impede the participation of the poor and render it more attractive for the (relatively) affluent are obtained from a probit analysis. A major flaw is the hike in the NREG wage relative to agricultural wage, as it undermines self-selection of the poor-especially in villages with a high degree of land inequality. In fact, two different mechanisms seem to be operating-one tends to exclude the poorest (the negative effect of the land Gini), and the other tends to promote the inclusion of the (relatively) affluent (the positive effect of the interaction of the land Gini and the ratio of NREG wage to agricultural wage). That awareness of the scheme matters is corroborated. However, the poor do not necessarily benefit as much as the non-poor at the entry point. But, with more information, corruption reduces at the implementation stage and this has the potential of serving the interests of the poor better.

Introduction

Rampant corruption is an endemic characteristic of anti-poverty schemes in many developing countries. Leakage in a rural employment guarantee scheme in India has occurred in various ways. Reports by the CAG, newspapers and magazines (*Mint, Times of India, the Hindu, Economic and Political Weekly*, among others) suggest that funds have been siphoned off by fudging muster rolls, paying lower daily wages, and taking bribes from participants[3]. Corruption can be controlled in two ways: by instituting government structures to create veto points and independent sources of political, administrative and judicial power; and second, by supplying information about government actions so that the media and the public can voice complaints and push for public accountability (Rose Ackerman, 1999).

In this paper we focus on an anti-poverty programme, the national rural employment guarantee scheme (NREG), that relies, in principle, on a self- selecting mechanism in its design to exclude the non-poor from crowding out the poor in accessing its benefits. The present paper assesses the effectiveness of the targeting accuracy of the NREG scheme in reaching the poor. The first section focuses on how one can assess the accuracy of targeting; the second section outlines the sample design and its implementation; the third section uses some descriptive measures to throw light on the targeting of the NREG; the fourth section focuses on the determinants of participation in this scheme; and, in the last section, concluding observations are made from a broad policy perspective.

1. How to Measure Targeting

A distinction may be drawn between broad and narrow targeting. Public spending that matters to the poor (e.g. primary education and health care) implies broad targeting. Since the non-poor usually have enough of these services, the benefits to the poor are greater. Considering that no particular group is excluded, broadly targeted programmes tend to be more popular than narrowly targeted ones, and hence more sustainable. However, not unexpectedly, a broadly targeted programme is often a costly way to reduce poverty.

By contrast, narrowly targeted programmes (e.g. rural public works) concentrate on the poor. This is sought to be achieved through self-selection or indicator targeting. In the case of self-selection, a cost of participation is built into the programme so that the non-poor

---

[3] See, for example, a recent account in Adhikari and Bhatia (2010) of the devious ways in which workers under the NREG are duped and cheated by those involved in its implementation (including village panchayats).

are effectively screened out (a work-requirement at a (relatively) low wage, for example, tends to exclude the non-poor from rural public works)[4]. Indicator targeting through income or its correlates such as landownership, caste affiliation, and gender is also widely used (as in *Swaranjayanti Gram Swarozgar Yojana* or SGSY). In either case, the concern is with minimizing targeting errors: leakage of benefits to the non-poor and limited coverage of the poor. However, poverty alleviation is not just a question of avoiding targeting errors. What is also important is that the costs of achieving this objective are minimized.

(a) National Rural Employment Guarantee Scheme

The NREGA of 2005 is perhaps the most significant social policy initiative in India in the last decade. Its main objective is "to provide enhancement of livelihood security of the households in rural areas of the country by providing 100 days of guaranteed wage employment to every household in unskilled manual work," at the minimum wage on demand within 15 days of asking for employment (Ministry of Law and Justice, Government of India, 2005). Some of its unique features include a time-bound employment guarantee and wage payment within 15 days (otherwise the government is penalized), prohibition of the use of contractors (who may impede the self-selection mechanism, divert funds and defraud workers) and machinery (to enhance direct benefits of the programme to the participants), and a mandatory 33% participation for women.[5]

The NREG's design conforms to Galasso and Ravallion's (2005) prescription of a targeted programme. They posit that capture by the non-poor occurs when public spending is on a private (excludable) good targeted to the poor, and there is no self-targeting mechanism to ensure that only the poor want to participate. Targeting is touted as one way to reduce capture; instead of relying on an administrator to choose the beneficiaries, the programme relies on the beneficiaries to select themselves by creating incentives so that only the poor will participate in the scheme. The cost of participation rises as income rises, but benefits remain the same thus making it less attractive to the non-poor. NREG has a self selecting

---

[4] For an important contribution that examines the incentive case for workfare, see Besley and Coate (1992).

[5] (a) There is a presumption that officials (e.g. Junior Engineer) and elected bodies (village panchayats) are less corrupt than contractors. Available evidence, however, points to pervasive corruption among them. A general point is that a monopoly element at any level or in any agency-public or private-induces rent-seeking behaviour. However, an advantage of locally elected bodies is that they are expected to be more transparent and accountable. (b) Ravallion (1990) argues against the restriction on use of machinery or a minimum share of wages in the programme outlay on the grounds that there is a strong presumption that the benefits of assets created under rural public works do not accrue to workers participating in them. Although selection and location of such assets are often manipulated by locally influential persons, the point is well taken as in principle there is no reason for the workers to be excluded from the benefits of a local road, village ponds, and embankments.

mechanism, which is supposed to ensure that anyone who can earn above the minimum wage will opt out of the program.

In practice, however, the self selection mechanism has been weakened in areas where the NREG wages were higher than the prevailing market wages.[6] An audit by the Comptroller and Auditor General (CAG, 2007) also revealed glaring weaknesses and leakages in the programme, and sparked a contentious public debate on the efficacy of anti-poverty programmes. For instance, only 3.2% of the registered needy households in 200 of India's poorest districts received the guaranteed 100 days of employment in a year. The benefits varied across states: Rajasthan emerged among the top performers — the average employment per participating household was 77 days of work. Kerala, a state with a good record of human development was at the bottom. Other failures relate to the distribution of job cards and the leakages in the selection, design and execution of projects.

2. Sample Design

The present analysis draws upon household data from three states in India: Rajasthan, Andhra Pradesh and Maharashtra. A representative sample was designed and implemented as follows. First, a list of NREG districts was compiled for each state. From these districts, three were selected on the basis of probability proportional to size (in this case, rural population as reported in the 2001 Census) in the case of Rajasthan. In a similar manner, six districts were selected for each of Andhra Pradesh and Maharashtra. The next step proceeded as follows. In the case of Rajasthan, for example, three villages were randomly selected from each district in Rajasthan, followed by a random selection of households. Twenty five households were selected from each of twenty villages spread over three districts in Rajasthan. In Andhra Pradesh and Maharashtra, these 25 villages were spread over 6 districts each. In each village, 20 households were randomly selected giving us a sample of 500 households in each of the three states surveyed.[7] Apart from household level information, individuals *within* households were also interviewed. The data include information on caste, occupation, landholdings,

---

[6] For validation using household data and a probit specification, see Shankar et al. (2010). The point is that, with recent hikes in the minimum wage rates and consequently in the NREG wage rates, the ratio of NREG wage rate to agricultural wages has risen well above 1-especially in slack agricultural periods-enhancing attractiveness of NREG to relatively affluent sections.

[7] The districts chosen in Rajasthan were Sirohi, Udaipur and Jhalwar. In Andhra Pradesh, the six districts chosen were Karimnagar, Mahbubnagar, Nalgonda, Warangal, Vizianagaram and Chittoor. The districts selected in Maharashtra were Gondia, Chandrapur, Yavatmal, Nanded, Hingoli and Ahmednagar.

household size, NREG participation, type of ration card, and PDS participation.[8] The number of individuals interviewed for Rajasthan, Andhra Pradesh and Maharashtra were, respectively, 2664, 2190, and 2270.

Alongside the survey, detailed interviews were conducted in eight villages selected according to the political affiliation of the sarpanch, in each state within the dataset.[9] Two trained interviewers (in each state team) who spoke the local language and were cognizant of the requirements of ethnographic research conducted the interviews. The interviews contain anecdotes and examples of corruption, the decision making process of panchayats (village councils), the choices made in the NREG, the influence of political parties in village level issues, the impact of caste and income on the ability to influence decisions, the information available to the respondent about the programme, among others.[10]

3: Descriptive Measures of Targeting Accuracy

(a) Cross-Tabulations

Let us first consider a few cross-tabulations. Table 1 gives a few key household characteristics that are often used as correlates of poverty (e.g. female household headship, landlessness or near landlessness, and membership of Scheduled Castes (SCs), Scheduled Tribes (STs), Other Backward Castes/ Classes OBCs), their poverty status, participation in NREG, and shares of NREG earnings in household income.

Let us first review the household characteristics. A vast majority of the sample households -90 per cent or more-were male-headed, with the highest share in Rajasthan and lowest in Maharashtra. The shares of the SCs, STs and OBCs were similar in Rajasthan, with the share of the OBCs being the highest; in Andhra Pradesh, by contrast, the STs accounted for under 10 per cent of the population while the OBCs were just under 50 per cent; and, in Maharashtra, the share of the OBCs was even higher (about 51 per cent), with considerably lower but nearly equal shares of the SCs and STs.

---

[8] NREG participation is measured using the question — are you a beneficiary of NREG? PDS participation is measured using the questions — whether the household draws foodgrains from PDS, whether the household draws sugar from PDS, and whether the household draws kerosene from PDS?

[9] Since the sarpanch is elected on non-party line, we found out his or her political affiliation during the household survey.

[10] Those interviewed included the village sarpanch, ex-sarpanch, deputy sarpanch, gram sevak, NREG assistant, caste leaders, panchayat members, village development committee members, political activists from the leading parties, NGOs in the village, the Patwari, moneylender, ration shop owner, worksite supervisor, NREG beneficiaries at the worksite, and individual asset creation beneficiaries. At the block level, we interviewed the Block Development Officer, the NREG programme officer, the junior engineers, ward panchayat members, and the Pradhan. We also interviewed the local member of the State Legislative Assembly (MLA).

Table 1: Correlates of Poverty, Participation in NREG, and Share of NREG Earnings in Household Income

Household and Village Characteristics	Rajasthan			Andhra Pradesh			Maharashtra		
	Share in population	Share in NREGS participation	Share of NREG earnings in household's income net of NREGS	Share in population	Share in NREGS participation	Share of NREG earnings in household's income net of NREGS	Share in population	Share in NREGS participation	Share of NREG earnings in household's income net of NREGS
Gender									
Male headed households	95.15	94.34 (65.25)	11.21	92.86	91.71 (77.56)	23.41	90.18	89.08 (64.27)	8.85
Female headed households	4.85	5.66 (76.76)	23.69	7.14	8.29 (91.17)	26.48	9.82	10.92 (72.17)	5.15
Social Group									
SC	25.36	27.03 (70.15)	11.86	29.23	34.86 (93.69)	23.16	13.11	16.75 (83.11)	7.25
ST	29.55	33.57 (74.76)	13.78	9.59	11.45 (93.69)	27.25	15.01	16.75 (72.58)	10.70
OBC	34.19	32.96 (63.46)	9.87	48.95	49.92 (80.09)	22.86	50.96	47.99 (61.26)	6.47
Others	10.91	6.44 (38.85)	10.89	12.23	3.77 (24.22)	26.52	20.91	18.50 (57.54)	13.82
Poverty Status									
Poor	40.98	49.92 (80.17)	16.01	25.34	28.11 (87.11)	25.80	24.45	27.49 (73.12)	9.94
Non-poor	59.02	50.08 (55.84)	9.22	74.66	71.89 (75.62)	22.81	75.55	72.51 (62.43)	7.96
Land owned group (Acres)									
Landless	33.61	26.08 (51.07)	15.26	43.44	47.27 (85.46)	26.17	35.41	42.96 (78.90)	10.72
>0-<=1	26.77	30.47 (74.90)	14.67	24.86	28.67 (90.56)	22.91	5.96	7.10 (77.51)	6.96
>1-<=2	24.51	30.31 (81.38)	10.58	16.40	14.88 (71.24)	24.09	14.67	16.22 (71.96)	10.48
>2-<=5	11.16	10.40 (61.35)	6.86	11.78	47.27 (85.46)	17.74	28.29	25.09 (57.69)	8.79
>5	3.95	2.75 (45.74)	15.26	3.51	28.67 (90.56)	14.17	15.67	8.63 (35.81)	2.68
Household size group									
4 and less	38.47	39.37 (67.36)	16.74	59.21	57.90 (76.81)	23.61	53.39	55.14 (67.18)	9.29
>4-<=8	55.55	53.67 (63.60)	10.03	39.92	40.99 (80.63)	23.72	44.44	43.92 (64.28)	7.67
>8-<=12	5.89	6.87 (76.85)	7.08	0.87	1.11 (100.00)	19.08	1.98	0.94 (30.87)	10.28
>12	0.10	0.08 (54.02)	0.68	-	-	-	0.19	-	-
All	100.00	100.00	11.63	100.00	100.00	23.61			8.48

Note: All calculations are at the household level. Figures in brackets represent shares within groups (row %).

Although the poverty-landownership relation has weakened in recent years due to diversification of rural economies, the latter continues to be used as a key correlate of poverty. The distributions of landownership for the three states differ strikingly in a few respects. The share of the landless was highest in Andhra Pradesh (about 44 per cent) while that of those owning more than 5 acres was about the lowest (about 3.5 per cent). Rajasthan had a slightly higher share of those owning more than 5 acres (about 4 per cent) while Maharashtra's was about 16 per cent.

Households tend to be large both among the poor and affluent. So the correlation with poverty is unlikely to be strong. But size-especially number of adult males and females-matters in determining participation in NREG as it allows diversification of household activities and sources of income. Household size distributions for the three states also differ. While in both Andhra Pradesh and Maharashtra more than half of the households had 4 members or less, the majority of households in Rajasthan ranged in size from 5 to 8 members.

- The sdesh, shares of participants *within* hares of NREG participants of male and female- headed households corresponded broadly to their shares in the population in the three states[11].

- Among the NREG participants, the largest share was that of the STs, followed by the OBCs and then the SCs in Rajasthan. Not surprisingly, therefore, among the STs, the participants accounted for the highest share (about 75 per cent). In contrast, in Andhra Pradesh, the OBCs accounted for nearly half the participants and the STs for barely 11.50 per cent. But these corresponded to their shares in the (household) population. What is indeed striking is that about 94 per cent of the SCs and STs participated in the NREG. In Maharashtra too, just under half of the participants were OBCs, slightly below their share in the population. However, within-group share of participants was highest among the SCs (about 83 per cent), followed by the STs (about 73 per cent).

- Going by the share of the landless among the participants, Andhra Pradesh had the highest share (about 47 per cent), followed by Maharashtra (about 43 per cent). To the extent that the landless are most prone to poverty, these shares suggest that the NREG was targeted well. However, in both Rajasthan and Andhra Praeach landowned interval rise with higher landowned intervals in *most* cases. In Maharashtra, by contrast, the within-group shares of participants fall.

---

[11] Note that when we refer to 'participants' we mean participating households.

- Participants by household size also reveal an interesting pattern. While NREG participant shares of different household sizes follow broadly their shares in the population, the within-group shares in Rajasthan are U-shaped, rise in Andhra Pradesh with household size, and fall somewhat rapidly in Maharashtra.

- Let us now consider targeting more precisely using an explicit criterion of poverty. The details of the poverty cut-off point(s) for different categories of poor and non-poor are given in Table A.1 in the annex. About half of the participants were poor in Rajasthan, about 28 per cent in Andhra Pradesh and about 27.50 per cent in Maharashtra.[12] As incidence of poverty in Rajasthan was substantially higher than in Andhra Pradesh and Maharashtra, it could be argued that the lower targeting accuracy in the latter is not so worrisome. However, this overlooks the fact that large majorities of the participants in these two states are non-poor. Yet another aspect of targeting is within-group participation. Of the poor, the highest share of participants is observed in Andhra Pradesh (about 87 per cent), followed by Rajasthan (about 80 per cent) and then Maharashtra (about 73 per cent).

- To assess the benefits of NREG, it is necessary to take into account the transfer benefit net of the opportunity cost of time.[13] As an approximation (on the presumption that the opportunity cost of time used in NREG is 0), we consider shares of NREG earnings in household income (net of NREG earnings). Some interesting findings are obtained. (i) Among female-headed households, this share accounts for nearly a quarter of household income and is a little more than twice as high as in male-headed households in Rajasthan, implying substantially greater importance of this source of income to the former. In contrast, the shares are high for both male and female-headed households in Andhra Pradesh but the difference is small. In Maharashtra, the corresponding shares are relatively low, with that of male-headed households exceeding that of female-headed households. (ii) Shares of NREG earnings in household income of various social groups vary over a small range, with the highest share accruing to the STs. (iii) Among the landless, the share of NREG earnings is highest or nearly so in all three states but the values vary.[14] In Andhra Pradesh, the share is more than a quarter of household income while in Maharashtra it is barely 11

---

[12] For an assessment of targeting accuracy of NREG, it is more appropriate to distinguish between the poor and non-poor on the basis of per capita income net of NREG earnings. This is a refinement that we propose to carry out in our subsequent research.

[13] See, for example, Ravallion and Datt (1995).

[14] In Rajasthan, the share of NREG earnings is just as high in the highest land owned category.

---

per cent. But, interestingly, even those with moderate amounts of land tend to rely on this source of income in these states-especially in Andhra Pradesh. (iv) Between the two household size groups, <4 persons and between 5-8 persons, the shares of NREG earnings vary across the states. While in Rajasthan the share of NREG earnings was about 17 per cent in the small households, in Andhra Pradesh it was about 24 per cent and, in Maharashtra, a little over 9 per cent. In Andhra Pradesh, the larger households also depended heavily on NREG, as the share was nearly a quarter of the household income. (v) In the three states, the poor depended more than the non-poor on NREG as a supplementary source of income, with the share being the highest in Andhra Pradesh (about 26 per cent).

•

(b) Disaggregation by Poverty Status

A more disaggregated view of targeting follows from a fourfold classification of households in terms of their poverty status.[15] The results are given in Table 2. The main findings are the following:

•   Of all participants in a state, Rajasthan had the highest share of acutely poor (over 34 per cent), with considerably lower shares in the other two states.

•   However, of the acutely poor, the highest share of NREG participants was in Andhra Pradesh (over 86 per cent), followed by Maharashtra.

•   At the other end of the income distribution is the share of the affluent in the NREG participants. While Andhra Pradesh had the highest share (well over 42 per cent), Rajasthan had the lowest but only a slightly lower share (about 30 per cent).

•   Among the affluent, Andhra Pradesh had the highest share of participants (about 72 per cent) while Rajasthan had the lowest and considerably lower share (over 49 per cent).

As the benefits to these groups depend on both numbers participating and days worked, graphical illustrations in Fig: 1 suffice.

---

[15] For details of this classification, see Table A.1 in the annex.

Fig: 1a Number of Days Worked by Poverty Status

**Number of days worked by participants of different poverty status: Rajasthan**
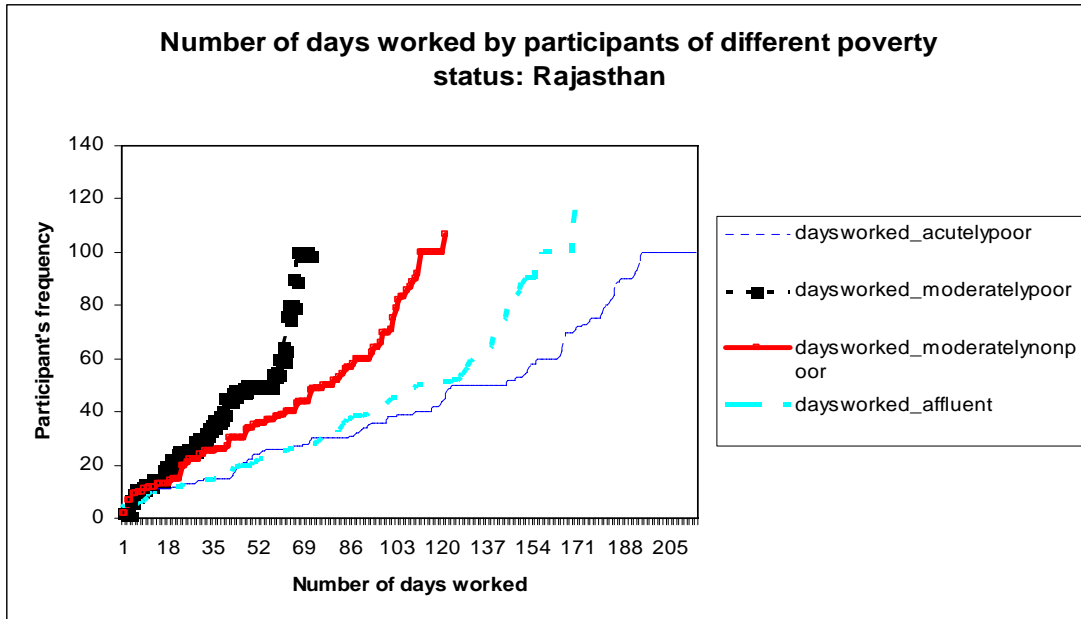
Let us first consider the graph for Rajasthan. To avoid repetition, we will confine our comments to just two numbers of participants, 20 and 100, for which corresponding number of days worked by *each* participant can be easily read from the graph. For the lower number of 20 participants, the days worked were a little over 50 among both the affluent and acutely poor, and below 20 among both the moderately poor and moderately non-poor. The disparity in days worked is larger as the number of participants rises to 100. At this upper end, the acutely poor worked about 200 days each while the affluent for about 170 days each. Both moderately poor and moderately non-poor worked considerably fewer days.

Fig: 1b

Number of days worked by participants of different poverty status: Andhra Pradesh
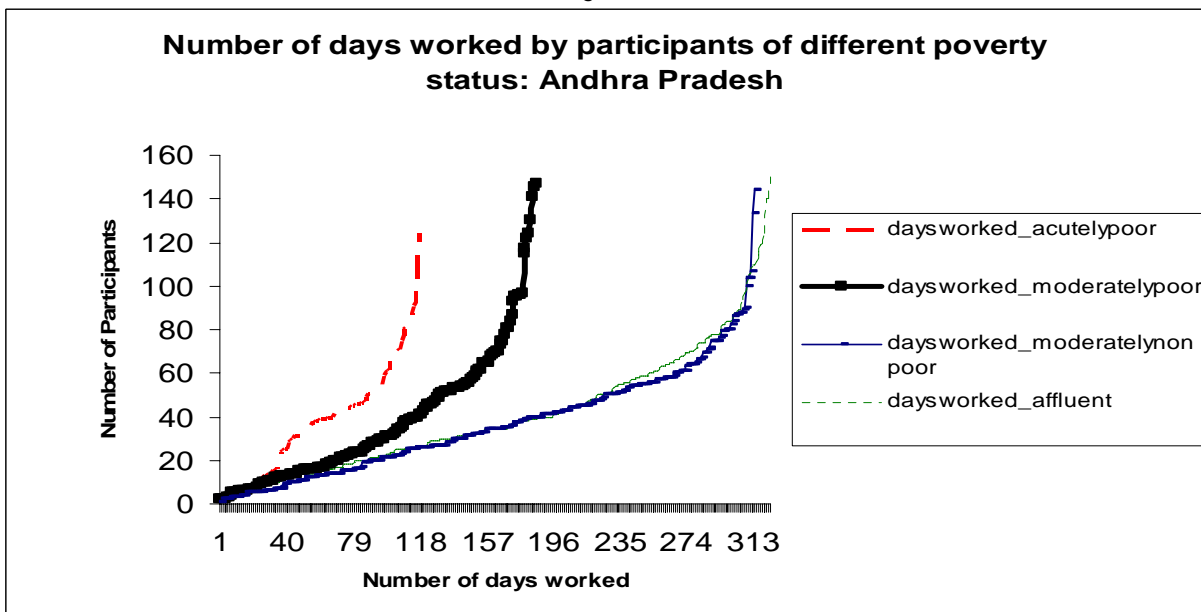
In Andhra Pradesh, there is a striking reversal. The disparity in number of days worked becomes larger between the acutely poor and affluent as the number of participants rises from 20 to 100. 20 acutely poor participants worked for about 40 days each while the same number of the affluent worked well over 100 days each. About 100 acutely poor worked for about 118 days each as against the affluent who worked for about 300 days each. So the benefits accrued disproportionately to the affluent participants.

Fig:1c
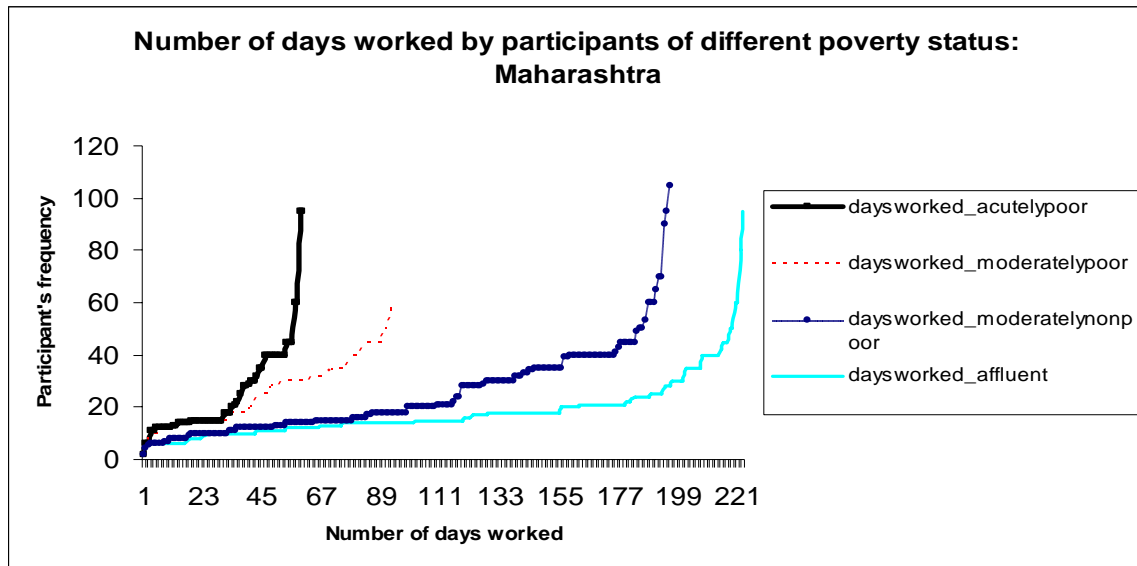
Disparities between the acutely poor and affluent participants are glaring in Maharashtra.too While 20 acutely poor participants worked for about 30 days each, the same number of the affluent worked for well over 100 days each. Just under 100 acutely poor participants worked about 50 days each as against the same number of the affluent working for well over 200 days each.

Table 2
Disaggregation of Targeting

State	Poverty Status					
	Acutely Poor (1)	Moderately Poor (2)	Moderately Non-Poor (3)	Affluent (4)	All Poor (5=1+2)	All Non-poor (6=3+4)
Rajasthan						
Participants	34.29(76.21)	15.64(90.49)	20.08(69.52)	29.99(49.34)	50.08(55.84)	49.92(80.17)
Non-participants	20.60(23.79)	3.16(9.51)	16.95(30.48)	59.29(50.66)	76.23(44.16)	23.77(19.83)
All	29.61	11.37	19.01	40.01	40.98	59.02
Andhra Pradesh						
Participants	12.32(86.24)	15.75(87.78)	29.48(82.41)	42.45(71.55)	71.89(75.62)	28.11(87.11)
Non-participants	7.20(13.76)	8.02(12.22)	23.03(17.59)	61.75(28.45)	84.78(24.38)	15.22(12.89)
All	11.22	14.09	28.10	46.59	25.34	74.66
Maharashtra						
Participants	10.71(84.14)	16.77(67.47)	35.82(69.72)	36.69(56.65)	72.51(62.43)	27.49(73.12)
Non-participants	3.76(15.86)	15.05(32.53)	28.95(30.28)	52.25(43.35)	81.19(37.57)	18.81(26.88)
All	8.28	16.17	33.42	42.13	24.45	75.55

N.B.: Figures in parentheses are the column percentages.
Sum of all row percentages between columns (1) through (4) adds up to 100 and, similarly, columns (5) and (6) add up to 100.

(c) E and F Errors

The accuracy of targeting can be judged in terms of the *E* and *F* errors. The *E* error is defined as $(NP)^P_h / N_h$, where the numerator denotes the number of non-poor participants and the denominator, N_h, denotes total *household* population. The *F* error, on the other hand, is defined as $(P)_h^{NP} / N_h$, where the numerator denotes number of poor not participating in NREG. The first error is often referred to as excessive coverage (denoted by E), and the second refers to failure to include the poor (denoted by F) or exclusion of the poor. Both are expressed as proportions of total household population. The sum of the two errors

$$E+F= [\ (NP)^P_h + (P)_h^{NP})] / N_h \ ....(1)$$

yields an aggregate measure of accuracy of targeting. The greater the $(E + F)$ value (the maximum being 1), the lower is the overall accuracy. Alternatively, excessive coverage could be normalized by the number of non-poor households, $(NP)_h$, and exclusion by the number of poor households, $(P)_h$.

Two issues are pertinent here: one is the relationship between these two types of errors and the other is their relative weights. It is arguable that an attempt to reduce the *E* error can cause the *F* error to rise, as some members of the target group are eliminated along with the non-target population. Social stigma associated with participation in a programme targeted to the poor may, for example, deter some among the target group from participating.

So a concentration on one or the other index may be somewhat restrictive. However, whether equal weights are justified is not obvious. This is merely a convenient procedure in the absence of a consensus on appropriate weights. Moreover, in the context of inter-temporal comparisons, the normalization used above is problematic. If, for example, the number of poor participating in the scheme falls marginally while the size of the poor population falls somewhat rapidly, the *F* error may register a substantial reduction, implying an improvement in targeting. In order to circumvent this difficulty, an alternative normalization could be used, in which the non-poor included and the poor excluded are expressed as proportions of the non-poor and poor, respectively. It is relevant in the present context as shares of poor vary across the three states.

Table 3: E and F Targeting Errors in NREGS

| State	Participants		E Error		F Error	
	%Poor	%Non-poor	$(NP)^P_h / N_h$	$(NP)^P_h /(NP)h$	$(P)_h^{NP} /N_h$	$(P)_h^{NP} /(P)_h$
Rajasthan	49.92	50.08	0.33	0.56	0.08	0.20
Andhra Pradesh	28.11	78.89	0.56	0.76	0.03	0.13
Maharashtra	27.49	72.51	0.47	0.62	0.07	0.27

.

If we go by the E error, Andhra Pradesh is the worst performer, and Rajasthan is clearly the best. When excessive coverage is normalized by the number of non-poor households, this ranking remains unaffected. On the other hand, the F error is relatively small, with Andhra Pradesh emerging as the best performer. With the normalization by the number of poor households, Andhra Pradesh remains the best, and Maharashtra the worst. Taking the sum of E and F errors, Rajasthan is the best and Andhra Pradesh is the worst.

(d) Stochastic Dominance

How well anti-poverty programmes are targeted may depend on the poverty threshold and the poverty index. Usually there is considerable disagreement on the poverty threshold. Nor is the use of a particular poverty index appealing, since different indices capture specific aspects of deprivation (Sen, 1979). Accordingly, some tests of stochastic dominance have been devised (Atkinson, 1987). These enable ordinal poverty comparisons for a range of poverty thresholds and a class of poverty indices. Extending these tests to the NREG, similar comparisons of their targeting accuracy can be made. Suppose there is agreement on a range of poverty thresholds (or on the upper limit). If the cumulative income distributions of participants in this programme are plotted and in case the cdf of NREGS participants lies

above that of non-participants over the complete range of poverty thresholds, the first-order dominance (FOD) holds. This implies that the targeting of the former is better in terms of a class of poverty indices comprising the head-count ratio, the poverty gap and a distributionally sensitive measure over the complete range of poverty thresholds (the Rawlsian maximin principle is a special case). If, however, the two curves intersect, a second-order dominance test is used that permits such comparisons for all such indices except the head-count index and so on. These dominance tests supplement the previous analysis, as the latter is based only on the head-count index and a particular poverty threshold (the latter is of course relaxable but tedious). Let us apply the stochastic dominance test to the NREG program.

Fig:2: Cumulative Distribution Functions of Participants in NREG and Non-Participants in Rajasthan
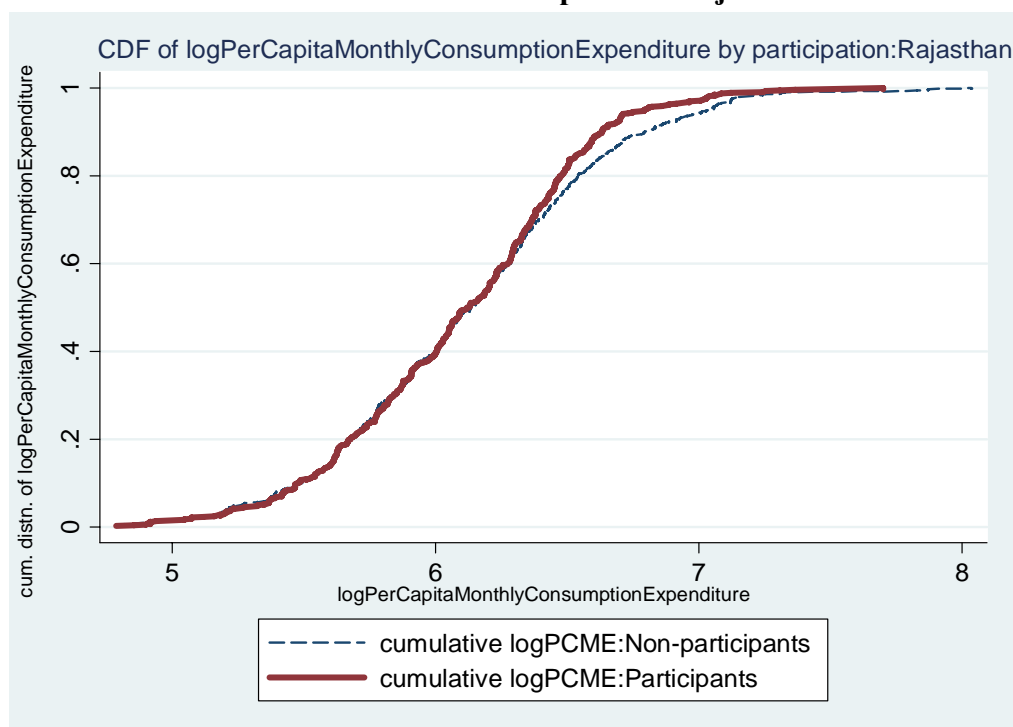
As per capita monthly expenditure is transformed logarithmically, a little below 6 is the cut-off for acute poverty, a little over 6 for moderate poverty and above 6.15 for moderate non-poverty.[16] There are two striking features: (i) Except for Andhra Pradesh, the cdfs of NREG participants and non- participants overlap over a wide range of per capita expenditure, implying the absence of first or second-order dominance. In other words, their distributions are almost identical, ruling out accurate targeting of NREG over a wide range of poverty thresholds in terms of FGT class of poverty indices.

---

[16] These of course vary with the state and so same thresholds for all three is a deliberate simplification.

**Fig:3 Cumulative Distribution Functions of Participants
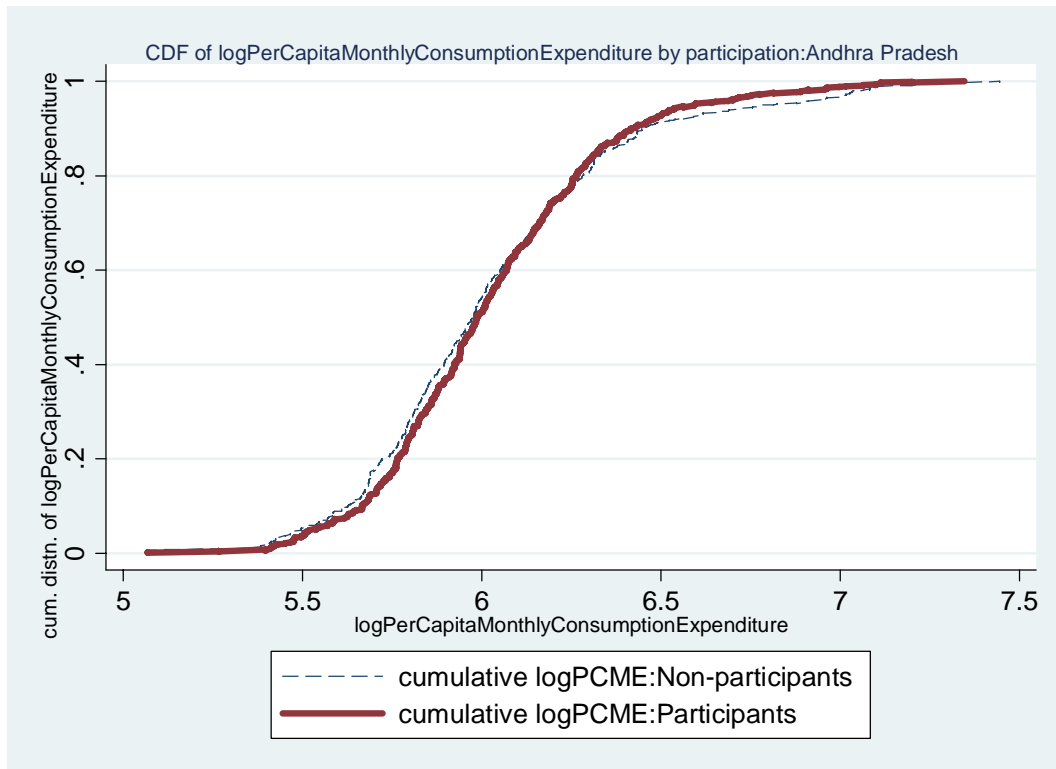in NREG and Non-Participants in Andhra Pradesh**

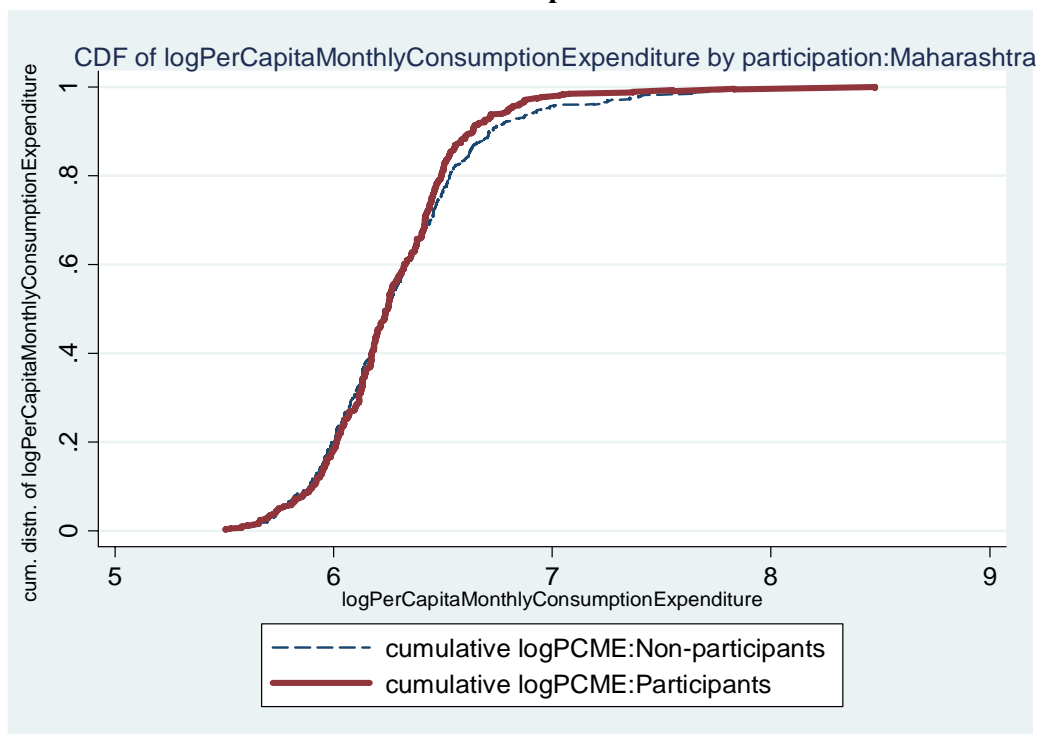CDF of logPerCapitaMonthlyConsumptionExpenditure by participation:Andhra Pradesh

**Fig:4 Cumulative Distribution Functions of Participants
in NREG and Non-Participants in Maharashtra**

CDF of logPerCapitaMonthlyConsumptionExpenditure by participation:Maharashtra

(ii) In Andhra Pradesh, however, a little below the acute poverty threshold and over a wide range of per capita expenditure, the cdf of non-participants exhibits first order stochastic dominance, implying that NREG was targeted well over this range of expenditure in terms of the FGT class of poverty indices.

Fig: 5 CDF of NREG Participants in Rajasthan, Andhra Pradesh and Maharashtra
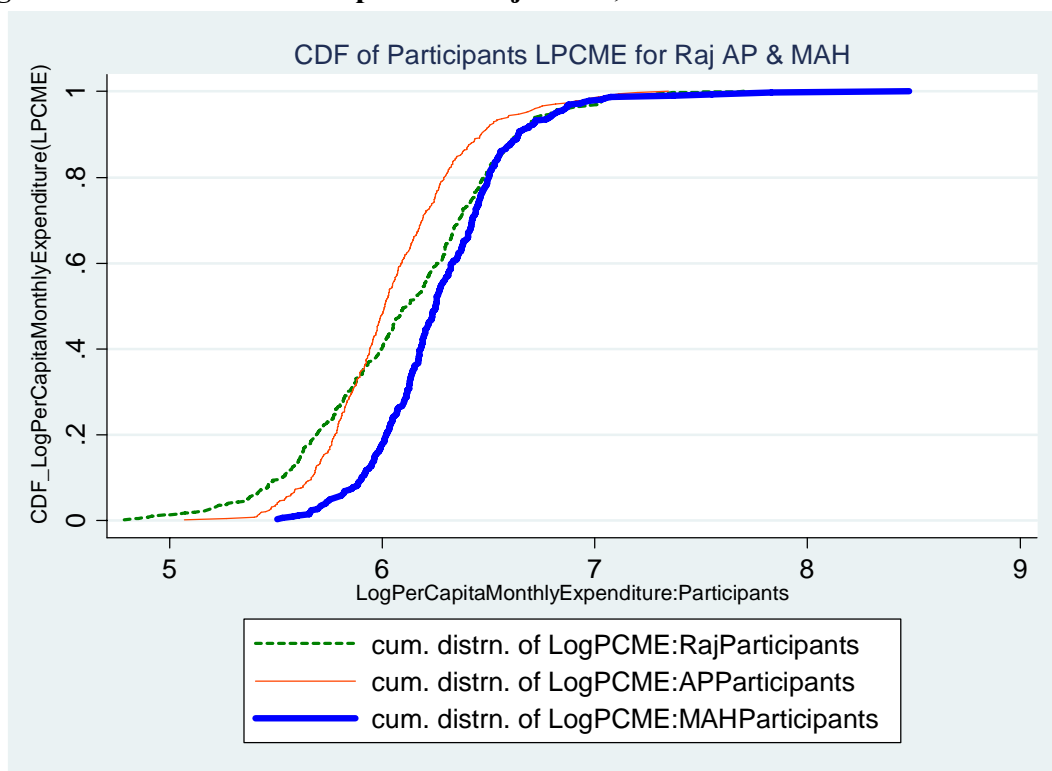
(iii) In Fig: 5, we have the plots of the cdfs of participants. While both Andhra Pradesh and Rajasthan are stochastically dominated (First Order Dominance) by Maharashtra over a wide range of per capita expenditure, between the former, Andhra Pradesh dominates Rajasthan. So in general targeting was the worst in Maharashtra for all FGT indices. However, because of the crossover of the Andhra Pradesh cdf nearer the value of 6 of log per capita monthly expenditure, it follows that targeting at low levels of expenditure was more accurate in Rajasthan.

4. Determinants of Participation in NREG

We have constructed a participation equation that enables us to assess the profile of a participant in NREG. . This offers more definitive insights into household and village characteristics that influence participation. The dependent variable is participation in NREG that takes the value 1 for participation and 0 otherwise. The right side variables include the

following: gender, age, age square, marital status, education (primary, middle, secondary, above secondary versus illiterate), social group (SC, ST, OBC versus Other), land owned (in acres), household size, square of household size, ratio of NREG wage to agricultural wage in a village and its square, land inequality in a village (the Gini coefficient) and its square, interaction of ratio of NREG wage to agricultural wage with land inequality in a village, average distance of worksite from the village, and attendance in village meetings.[17] This equation is estimated using a probit specification.

(a) Probit Model

Consider a class of binary response models of the form.[18]

$$P(y = 1 \mid \mathbf{x}) = G(\beta_0 + \beta_1 x_1 + ... + \beta_k x_k) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta})........(2)$$

where G is a function taking on values strictly between 0 and 1: $0 < G(z) < 1$, for all real numbers z. This ensures that the estimated response probabilities are strictly between 0 and 1. In the probit model, G is the standard normal cumulative distribution function (cdf), expressed algebraically as

$$G(z) = \Phi(\mathbf{z}) = \int_{-\infty}^{z} \phi(v) \, dv \qquad (3)$$

where $\phi(z)$ is the standard normal density

$$\phi(z) = (2\pi)^{-1/2} \exp(-z^2 / 2)........(4)$$

The G function in (3) is increasing in z. Each increases most quickly at z=0, $G(z) \to 0$ as $z \to -\infty$, and $G(z) \to 1$ as $z \to \infty$.

If x_j is a continuous variable, its partial effect on $p(\mathbf{x}) = P(y = 1 \mid \mathbf{x})$ is obtained as

$$\frac{\partial P(\mathbf{x})}{\partial x_j} = g(\beta_0 + \mathbf{x}\boldsymbol{\beta})\beta_j, \text{ where } g(z) \equiv \frac{dG}{dz}(z)...........(5)$$

Since G is the standard normal cumulative distribution, g is the normal density function, g(z) >0 for all z. Thus the partial effect of x_j on $p(\mathbf{x})$ depends on $\mathbf{x}$ through the positive quantity $g(\beta_0 + \mathbf{x}\boldsymbol{\beta})$, implying that the partial effect always has the same sign as β_j.

The model is estimated using maximum likelihood estimation.

---

[17] For details of the variables used, see Table A.2.
[18] This is adapted from Wooldridge (2006).

(b) Results[19]

The probits (Table 4) reveal that in all three states, as the age increased, the likelihood of participating in NREG increased, but this likelihood was reversed after a certain age (i.e. older persons were less likely to participate in manual labour). If we take the SCs and STs as being the more deprived and socially excluded, in all three states, these groups were more likely to participate in the NREG, as compared to the others. Also, the OBCs were more likely to participate in Rajasthan and Andhra Pradesh. The marginal effects for each of these deprived groups were stronger in Andhra Pradesh.

In Rajasthan, as the number of adult males in a household increased, the likelihood of participation declined, and similarly for adult females in a household. Compared to illiterates, those with primary, middle and secondary school education were less likely to participate in the NREG. Relative to others, the SCs, STs and OBCs were significantly more likely to participate in NREG, implying better targeting on the disadvantaged groups.

In Andhra Pradesh, educated persons were significantly less likely to participate in the NREG, with the most educated (i.e. above higher secondary) least likely to participate, relative to illiterates. The SCs and STs were more likely to participate than the OBCs, and all three groups were more likely to participate in the NREG, as compared to others. Households with more adult males were more likely to participate while households with more adult females were less likely to participate in the NREG. As the average distance to the worksite increased, the propensity to participate in the NREG decreased.

In Maharashtra, males were significantly more likely to participate than females. Married persons were less likely to participate, as compared to others. Somewhat surprisingly, there was no significant relationship between education and participation. The SCs and STs were more likely to participate than other castes, while the OBCs showed no significant relationship with participation.

As land continues to be an important asset in rural areas *despite* declining importance of agriculture, it is interesting to note that there is an inverse relationship between amount of land owned and participation in Andhra Pradesh and Maharashtra but the marginal effect is small-especially in the latter.

---

[19] This section draws upon Shankar et al. (2010)

Table 4: Estimation of NREGS Participation Equation

Dependent variable :Estimation methods	NREGS Participation: Probit regression					
Models	Rajasthan		Andhra Pradesh		Maharashtra	
Explanatory variables	Coefficients (t-value)	Marginal effects (t-value)	Coefficients (t-value)	Marginal effects (t-value)	Coefficients (t-value)	Marginal effects (t-value)
Gender	-0.06 (-0.62)	-0.01 (-0.62)	0.04 (0.50)	0.01 (0.50)	0.29*** (3.31)	0.05*** (3.28)
Age	0.18*** (9.62)	0.03*** (8.75)	0.20*** (9.35)	0.07*** (10.02)	0.18*** (9.99)	0.03*** (10.64)
Square of Age	-0.002*** (-8.76)	-0.0003*** (-8.32)	-0.002*** (-8.34)	-0.001*** (-8.89)	-0.002*** (-9.69)	-0.0004*** (-10.36)
Whether Married	-0.13 (-0.71)	-0.02 (-0.71)	-0.07 (-0.40)	-0.02 (-0.40)	-0.47*** (-2.61)	-0.09*** (-2.61)
Below primary education	-0.40*** (-3.38)	-0.05*** (-3.47)	-0.33*** (-3.26)	-0.12*** (-3.37)	0.15 (1.29)	0.03 (1.25)
Middle school	-0.67*** (-3.75)	-0.07*** (-4.88)	-0.69*** (-4.25)	-0.21*** (-5.37)	0.16 (1.13)	0.03 (1.07)
Secondary education	-0.60** (-2.36)	-0.06*** (-3.72)	-0.61*** (-4.16)	-0.19*** (-5.06)	0.20 (1.41)	0.04 (1.31)
Higher secondary plus	-0.93*** (-4.85)	-0.08*** (-6.57)	-0.45** (-2.56)	-0.15*** (-2.93)	-0.25 (-1.31)	-0.04 (-1.50)
SC	0.34* (1.85)	0.06* (1.64)	0.85*** (5.62)	0.32*** (5.69)	0.44*** (3.14)	0.10*** (2.66)
ST	0.36* (1.87)	0.06* (1.68)	0.87*** (5.08)	0.34*** (5.26)	0.28** (2.03)	0.06* (1.82)
OBC	0.42** (2.26)	0.07** (2.01)	0.62*** (4.50)	0.22*** (4.62)	0.07 (0.62)	0.01 (0.62)
Amount of land owned	-0.02 (-0.73)	-0.002 (-0.73)	-0.12*** (-5.01)	-0.04*** (-4.99)	-0.07*** (-5.01)	-0.01*** (-5.10)
Number of adult male	-0.13** (-2.54)	-0.02*** (-2.6)	0.09** (2.07)	0.03** (2.06)	-0.19*** (-3.91)	-0.04*** (-3.86)
Number of adult female	-0.21*** (-3.48)	-0.03*** (-3.4)	-0.14*** (-2.94)	-0.05*** (-2.92)	-0.14** (-2.21)	-0.03** (-2.23)
Ratio of NREG to AGR wage rate	-1.25* (-1.93)	-0.18** (-2.02)	4.16** (2.39)	1.51** (2.39)	2.87*** (4.95)	0.53*** (5.12)
Square of Ratio of NREG to AGR wage rate			-1.76** (-2.42)	-0.64** (-2.42)	-0.75*** (-4.28)	-0.14*** (-4.36)
Land Gini index	-3.88*** (-2.85)	-0.56*** (-3.16)	0.57 (1.31)	0.21 (1.30)	0.47 (1.55)	0.09 (1.56)
Interaction: Ratio NREGAGRWR with LGI	3.30** (2.54)	0.47*** (2.72)				
Average distance of site from the village	-0.05 (-0.59)	-0.01 (-0.59)	-0.39*** (-4.77)	-0.14*** (-4.85)	0.00 (-0.05)	0.00 (-0.05)
%hhs attending meetings	0.01** (2.53)	0.001** (2.56)	0.06*** (2.89)	0.02*** (2.88)	0.00 (-1.10)	0.00 (-1.11)
Square of %hhs attending meetings			-0.001*** (-3.47)	-0.000*** (-3.46)		
%hhs with both TV and Cellphone					-0.03*** (-4.20)	-0.01*** (-4.19)
Interaction: %hhs MEETATTEND with %hhs with TVCELL					0.0002** (2.01)	0.00003** (2.02)
Constant	-1.58** (-2.14)		-6.72*** (-5.47)		-5.22*** (-7.58)	
Number of observations	2684		2190		2270	
Pseudo R-square	0.3220		0.3512		0.3577	
Wald chi-square	392.63***		649.76***		498.20***	

N.B. *, **, *** = significance at the 10 %, 5 % and 1 % levels, respectively.

Since the incentive argument hinges on the NREG wage /agricultural wage ratio, its role is analysed taking into account its direct effect as well as its interaction effect through the land Gini.

Participation decreases with the ratio of NREG wage to agricultural wage in Rajasthan while in both Andhra Pradesh and Maharashtra it varies with this ratio. However, in the latter the square of this ratio has large negative effects, implying that the positive relationship between participation and NREG/agricultural wage ratio weakens at higher values of the ratio. While the effect of inequality in land distribution is negative in Rajasthan, its interaction with the NREG/agricultural wage ratio has a large positive effect. As this more than offsets the negative effect of this ratio, it is plausible that there are two mechanisms at work-one tends to exclude the poorest (the negative effect of the Gini) and the other tends to promote the inclusion of the affluent (the interaction of the Gini and the ratio of NREG/agricultural wage).

In Andhra Pradesh, the land Gini was not significant, implying that inequality in the distribution of landholdings does not influence participation in NREG. In Maharashtra, as the Gini effect was positive but weakly significant, not much should be made of it.

In Rajasthan and Andhra Pradesh, the higher the share of households participating in a public meeting in the village, the higher was the probability of a household participating in NREG. In the latter, however, the positive effect weakened with higher values of participation in a public meeting. Somewhat surprisingly, in Maharashtra, the higher the percentage of households with cell phones and televisions in a village, the lower is the probability of participation in NREG. However, when it is interacted with the percentage of households who attended a village meeting, the positive coefficient weakens the negative effect slightly. Presumably, TVs and cell- phones as conduits of information substitute for attendance in these meetings. Altogether, the link between attendance in these meetings and participation in NREG is corroborated. However, it would be naïve to assert that more information is largely to the advantage of the poor, as some other evidence suggests that it favoured the entry of non-poor while the acutely poor, who neither possessed TVs or cell-phones nor attended public meetings, did not know and therefore did not participate. However, with more information, corruption at the implementation stage reduces and has the potential of serving the interests of the poor better.[20]

---

[20] A companion piece by Shankar et al. (2010) offers a more careful scrutiny of the role of information in participation in NREG, based on both econometric and ethnographic evidence.

5. Conclusions

Several tests of targeting accuracy of the NREG are employed in the preceding analysis. These focus on descriptive measures such as proportions of poor and non-poor participants, and more disaggregated measures whether they belonged to acutely poor, moderately poor, moderately non-poor and (relatively) affluent households. These are supplemented by computations of E (excessive coverage) and F (failure to include the poor) errors of targeting accuracy. As these are based on specific cut-off points of expenditure per capita, these are no more than variants of the headcount index. As benefits from this scheme depend not just on participation but also on number of days worked and wage rates earned, additional exercises taking these aspects into account were carried out.

In order to overcome the difficulties arising from the use of a headcount index and a specific poverty threshold –including separate ones for acute and moderate poverty-use is made of stochastic dominance tests that allow for inferences on targeting accuracy for the FGT class of poverty indices and a range of (permissible) poverty thresholds. Finally, to understand better the factors that enable or impede participation of different groups of households – awareness of the scheme, education, demographic characteristics (e.g. age, household composition), distance to worksite, attractiveness of NREG relative to other options in rural labour markets, land inequality as a proxy for dominant or influential groups colluding with village panchayats and officials to extract a disproportionately large share and their interaction- a probit analysis was carried out. A distillation of the results, based on these exercises, is given below from a broad policy perspective.

If we go by the proportion of poor participants, Rajasthan was the best performer. Even in terms of the share of acutely poor participants, Rajasthan was way ahead of the other two states. However, this is merely one aspect of targeting.

Using the E and F errors, we are able to draw inferences about both excessive coverage (or participation of non-poor) and failure to include the poor (or exclusion of the poor). These measures further corroborate Rajasthan's superiority. Andhra Pradesh, on the other hand, turns out to be the worst performer.

Another approach is to test for stochastic dominance of the cumulative distribution functions of the participants and non-participants over a wide (but permissible) range of poverty thresholds. Except for Andhra Pradesh, in both Rajasthan and Maharashtra, these distributions completely overlap over a very wide range of per capita expenditure, implying that the participants were not more or less poor (in the FGT class of poverty indices) than the

non-participants. In Andhra Pradesh, by contrast, over a wide range beginning from a little under the acute poverty threshold, the NREG participants were poorer than others (in terms of all these poverty indices). Another interesting finding is that targeting was the worst in Maharashtra while Rajasthan performed better than Andhra Pradesh at low levels of per capita monthly expenditure.

If we supplement our analysis with that of days worked by poverty status, we get another striking contrast. In Rajasthan, the acutely poor participants worked much longer than the affluent. But there was a reversal in Andhra Pradesh, as the affluent workers worked for much longer duration. Disparities in number of days worked were glaring in Maharashtra too, as the affluent worked far longer than the acutely poor. So there is substantial evidence pointing to disproportionately larger benefits accruing to affluent sections in these two states.

Whether the poor benefited substantially requires us to look at shares of NREG earnings in household income. In all three states, the poor depended more on the NREG as a source of supplementary income than the non-poor, with the share being the highest in Andhra Pradesh. Disregarding the benefits to the non-poor, it follows that Andhra Pradesh was clearly the best performer.

Interesting insights emerge from the analysis of determinants of participation. Some correlates of poverty that favoured participation in NREG included illiteracy, landlessness, membership of SCs, STs and OBCs.

A major flaw in the design of the NREG is the hike in its wage relative to agricultural wage, as it undermines self-selection of the poor-especially in villages with a high degree of land inequality. In fact, in Rajasthan, for example, two different mechanisms appear to be operating-one tends to exclude the poorest (the negative effect of land Gini), and the other tends to promote the inclusion of the relatively affluent (the interaction of the Gini and the ratio of NREG wage to agricultural wage). That hikes in minimum wages and consequently in NREG wages hurt the poor more is seldom highlighted in the on-going debates.

Another flaw that may impede the participation of the poor-especially those lacking physical stamina-is distance to worksite. In Andhra Pradesh, the longer the distance, the lower was the participation. To the extent that location of locally useful projects are feasible nearer the habitation, it is plausible that participation of the poor would increase.

That awareness of the scheme-captured through an index of participation of village community in public meetings- matters is corroborated by our analysis. However, it would be naïve to assert that more information is largely to the advantage of the poor, as some other evidence (from a companion study) suggests that it favoured the entry of non-poor while the

acutely poor, who neither possessed TVs or cell-phones nor attended public meetings, did not know and therefore did not participate. However, with more information, corruption at the implementation stage reduces and has the potential of serving the interests of the poor better.

In conclusion, if targeting of NREG is unsatisfactory, it need not necessarily lead to a pessimistic view. Some design and implementation issues require careful scrutiny if the aim is to enhance substantially the benefits to the poor within current budgetary constraints.

References

Adhikari, A., and S. Bhatia (2010) "NREGA Wage Payments: Can We Bank on the Banks?", *Economic and Political Weekly*, XLV(1), 30–37.

Atkinson, A.B. (1987) "On the Measurement of Poverty", *Econometrica*, 55, 749–64.

Besley, T. and S. Coate (1992) "Workfare versus Welfare: Incentive Arguments for Work Requirements in Poverty-Alleviation Programs", *The American Economic Review*, 82(1), 249–61.

CAG (2007) *Review of NREGA* (draft report submitted to Ministry of Rural Development, Government of India).

Gaiha, R (2000) "*Do Anti*-Poverty Programs *Reach* the Rural *Poor* in India?" *Oxford Development Studies* 28(1).

Galasso, Emanuela & Ravallion, Martin (2005). "Decentralized Targeting of an Antipoverty Programme", *Journal of Public Economics*, 89(4), 705–727.

Ravallion, M. and G. Datt (1995) "Is Targeting Through a Work Requirement Efficient? Some Evidence for Rural India", in D. Van De Walle and K. Nead (eds), *Public Spending and the Poor: Theory and Evidence*, The World Bank, Washington, DC (1995), pp. 413–414.

Rose-Ackerman, S. (1999), *Corruption and Government. Causes, Consequences and Reform,* Cambridge: Cambridge University Press).

Sen, A. (1979) "Issues in the Measurement of Poverty", *Scandinavian Journal of Economics*, 81.

Shankar, S., Gaiha, R. and R. Jha (2010) "Information and Corruption: The National Rural Employment Guarantee Scheme in India", Canberra: ASARC Working Paper.

Wooldridge, J. M. (2006) *Introductory Econometrics*, Third Edition, Thomson South-Western.

Table A.1

Disaggregation of Households by Poverty Status

Levels of poverty	Rajasthan	Andhra Pradesh	Maharashtra
Acute poverty	If per capita monthly consumption expenditure<Rs.383	If per capita monthly consumption expenditure<Rs.299	If per capita monthly consumption expenditure< Rs. 371
Moderate poverty	If per capita monthly consumption expenditure>=383 but < Rs.450	If per capita monthly consumption expenditure>=Rs.299 but<Rs.352	If per capita monthly consumption expenditure>=Rs.371 but<Rs.436
Moderate Non-poverty	If per capita monthly consumption expenditure>=Rs.450 but Rs.<585	If per capita monthly consumption expenditure>=Rs.352 but Rs.<458	If per capita monthly consumption expenditure>=Rs. 436 but Rs.<567
Affluent	If per capita monthly consumption expenditure>= Rs.585	If per capita monthly consumption expenditure>=Rs.458	If per capita monthly consumption expenditure>=Rs.567
Poverty	If per capita monthly consumption expenditure< Rs.450	If per capita monthly consumption expenditure<Rs.352	If per capita monthly consumption expenditure<Rs.436

Table A.2: Definitions of Variables used in Probit Analysis

Dependent Variable	Definition
NREGS Participation	NREGS Participation (=1 if participated in NREGS; 0 otherwise)
Explanatory Variables	
Gender	Gender of household member or head (=1 if male, 0 if female)
Age	Age of household member or head
Square of Age	Square of Age of household member or head
Whether Married	Dummy for being Married (=1 if married; 0 otherwise)
Illiterate (Reference)	Dummy for no education (=1 if illiterate, 0 otherwise)
Below primary education	Dummy for primary education (=1 if literate but upto primary education, 0 otherwise)
Middle school	Dummy for middle school (=1 if passed only upto middle school, 0 otherwise)
Secondary education	Dummy for secondary education (=1 if literate but upto secondary education, 0 otherwise)
Higher secondary plus	Dummy for higher secondary and above (=1 if education upto higher secondary and above, 0 otherwise)
SC	Dummy for SC (=1 if household or member of SC, 0 otherwise)
ST	Dummy for ST (=1 if household or member of ST, 0 otherwise)
OBC	Dummy for OBC (=1 if household or member of OBC, 0 otherwise)
Others (Reference)	Dummy for Others (=1 if household or member of Others caste, 0 otherwise)
Amount of land owned	Amount of land owned
Square of amount of land owned	Square of amount of land owned
HH size	Size of the household
Square of hh size	Square of size of the household
Number of adult male	Number of adult male in the household
Number of adult female	Number of adult female in the household
Ratio of NREG to AGR wage rate	Ratio of NREG wage to agricultural wage rate at village level
Square of Ratio of NREG to AGR wage rate	Square of ratio of NREG wage to agricultural wage rate at village level
Land Gini index	Gini index of inequality of landholdings
Square of Land Gini index	Square of Gini index of inequality of landholdings
Interaction: Ratio NREGAGRWR with LGI	Interaction of Ratio of NREG wage to agricultural wage rate at village level with Gini index of inequality of landholdings
Average distance of site from the village	Average distance of site from the village
%hhs attending meetings	%households attending meetings at village level
Interaction: %hhs MEETATTEND with LGI	Interaction of %households attending meetings with Gini index of inequality of landholdings at the village level
%hhs with TVCELL	%households with television and cell-phone both at village level
Interaction: %hhs MEETATTEND with %hhs with TVCELL	Interaction of %households attending meetings with %households with both TV and Cellphone at village level