Targeting and Efficiency in the Public Distribution System

Case of Andhra Pradesh and Maharashtra

This paper compares the public distribution of food in Andhra Pradesh and Maharashtra. Based on the 50th round of National Sample Survey (NSS) household consumption survey data, the authors examine differences in utilisation, extent of targeting, magnitude of income transfers and the cost-effectiveness of food subsidies. The findings suggest policy reforms in favour of self-targeting and greater operational efficiency.

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I Introduction

The public distribution system (PDS) has been one of the most important elements in India's safety net system for almost 50-years. The scale of the programme is evident from the fact that it handles 15 per cent of the total availability of rice and wheat. While the PDS provides a degree of food security to some sections of the population, there are doubts whether the benefits are commensurate with the costs of running the system.[1] The principal criticism relates to the lack of targeting. The PDS is accused of two kinds of targeting error. While large numbers of the poor do not have access to the PDS, there is, on the other hand, little or no attempt to deny access to the affluent.

The responsibility for operating the PDS is shared between the central and state governments. The central government procures, stocks and supplies grain and absorbs the costs of these operations. Once the grain is allocated to the states, it is the job of the state government to 'lift' the grain and distribute it to the retail PDS outlets across the state. Hence, the PDS performance depends on foodgrains operations of the central government as well as the distribution of subsidised grain by state governments. As a result, regional diversity in PDS performance can be expected and is indeed a finding of earlier studies [Ahluwalia 1993, Dev and Suryanarayana 1991 and Parikh 1994].

In this paper, we focus attention on the regional variations in the operation of the PDS by comparing the public distribution of food in Andhra Pradesh (AP) and Maharashtra. Our choice of states is guided by the fact that AP is in several ways a 'special' state in its implementation of the PDS, while Parikh (1994) described Maharashtra as an "average state as far as the PDS is concerned".[2]

Ever since the Telegu Desam was propelled into power largely on the basis of its electoral promise of cheap rice (at Rs 2 per kg), rice subsidies have been a major issue in AP state politics. There are no parallels for such a development in other states. To appreciate the transformation of the state government's role, consider Table 1 [from Indrakant 2000] which presents the central and state subsidy on a tonne of rice for the period 1980-81 to 1994-95. The central subsidy is the difference between the issue price and the economic cost consisting of costs of procurement, storage and transport. The state subsidy is the difference between the central issue price and the issue price at retail outlets. As Table 1 shows, the state subsidy in AP has been increasing over the years, and has been substantially greater than the central subsidy in recent years. This is in contrast to the other states where the state government subsidies are typically significantly smaller than central subsidies [Radhakrishna et al 1997]. The AP rice subsidy scheme is also notable for efforts to target the benefits. Those identified as poor are issued a white card which enables them to receive higher subsidies than the non-poor or pink card holders.

In terms of political commitment, the extent of state government's funding and the targeting design, the AP programme is a clear departure from the other states as well as from its own past. But have the gains especially to the poor been any different? A comparison with the pre-1982 food subsidy regime is not possible because of the absence of household level information on subsidy use for that period.

Table 1: Central and State Subsidy on a Tonne of Rice: AP

(Rs/tonne)

Year	Central Subsidy	State Subsidy	Total Subsidy
1980-81	340	-	340
1981-82	429	-	429
1982-83	534	29.19	563.19
1983-84	667	523.49	1190.49
1984-85	749	725.39	1474.39
1985-86	773	612.56	1385.56
1986-87	804	818.26	1622.26
1987-88	809	993.61	1802.61
1988-89	817	809.41	1626.41
1989-90	1242	1389.54	2631.54
1990-91	1280	1511.79	2791.79
1991-92	805	1973.23	2778.23
1992-93	869	1206.03	2075.03
1993-94	967	2825.00*	3792
1994-95	1379	2825.00*	4204

Note: * Figures are provisional.
Source: Indrakant S (2000).

That is why we compare the AP subsidy scheme to that of Maharashtra. In this comparison, Maharashtra can be regarded as the benchmark case, and one can ask whether AP because of its vigorous PDS has been able to achieve outcomes that are significantly different from that of an 'average state'. Conversely, if AP is the yardstick, it can represent what an 'average state' can achieve by a similar expansion of food subsidies.

We use data from the 50th round of the NSS of consumption expenditures of households during the period June 1993 to May 1994. The NSS uses a stratified two-stage sampling design, first sampling clusters (which are villages in rural areas and urban blocks in urban areas) and then selecting 10 households within each cluster. The survey elicits consumption expenditures for the household for the month preceding the date of survey. The date of survey varies between the clusters as the survey is done at four different times (corresponding to quarters) within the 12 months from June to May.

The PDS supplies many commodities besides wheat and rice. In this paper, we focus exclusively on the public distribution of foodgrains with respect to the following features:

(i) Variations in the patterns of utilisation of the PDS, as well as some tentative reasons for the differential patterns of utilisation.

(ii) The degree of success in targeting in the two states.

(iii) Estimates of the implicit subsidies by expenditure groups in the two states.

(iv) The cost of providing a rupee of income support to a target group. The target group is defined as the bottom x deciles where we consider different choices of x.

I Utilisation

We first consider differences in utilisation of the PDS for the state as a whole. Compared to Maharashtra, a greater fraction of the population uses the PDS in Andhra Pradesh. About 57 per cent of households in AP are beneficiaries of the public distribution system, the overwhelming majority of them buying rice. The corresponding figure is 33 per cent in Maharashtra. These figures can be regarded as unconditional averages. Table 2 presents these figures for rural and urban areas separately.

Utilisation of the PDS is an outcome of household decisions which in turn can be thought of as a function of characteristics relating to the household (e g, income, tastes, endowments), PDS (e g, local availability of ration shops, ease of obtaining ration cards, the issue price, the ration quota) as well as the prices of market goods that are close substitutes (e g, prices of market rice and market wheat). The differences in utilisation between states must then be due to differences in these variables. Information from the NSS survey is insufficient to disentangle all of these reasons for use/non-use. The major difficulties are in assessing variation in PDS characteristics such as the costs of obtaining ration cards or the extent of ration quota.[3] However, NSS data do allow us to assess the role of endowments and geographical coverage in determining utilisation rates.

First, consider the role of endowments. Some households may not purchase wheat or rice from any source because of endowment effects [Ahluwalia 1993 and Dev and Suryanarayana 1991]. Such considerations might be particularly important in rural areas where consumption out of home production is important. To see its importance, consider the number of PDS users as a proportion of total purchasing population rather than of total population. For the states as a whole, the proportion of grain purchasers that use the PDS is about 63 per cent in AP and 38 per cent in Maharashtra. From the second and third columns of Table 2, we can see that the difference between unconditional averages and averages conditioned for grain purchasers is driven by the rural areas. The averages change very little for urban areas. Hence it seems likely that these differences reflect the effect of endowments in the form of food stocks from home production.

Second, consider the issue of geographical coverage. It is well known that in many states, the PDS has not achieved universal geographical coverage because of the absence of PDS retail outlets in some regions. In particular, the PDS has been accused of urban bias especially in its early years. However, the geographical coverage cannot be directly deduced from the NSS data because the survey does not give information on whether the households that did not buy PDS grain did so out of choice or because a PDS sales outlet was not available in their area. Hence, even though utilisation is contingent on access, non-purchase of PDS grain is not equivalent to no access.[4]

To obtain a measure of access/coverage, we use the two-stage sampling design of the survey. It seems reasonable to assume that if at least one household in the sampled cluster purchases PDS grain, then a PDS outlet is available to all households in that cluster. We therefore regard a cluster where at least one household purchases PDS grain as a cluster that has geographical access to PDS. Defined this way we find that the geographical coverage of the PDS in AP is almost universal since 98 per cent of clusters do have access. In Maharashtra, the corresponding figure is 71 per cent. Since coverage in AP is nearly universal, both urban and rural areas are equally well covered. The PDS in Maharashtra cannot be accused of urban bias either, since 74 per cent of rural clusters have access to PDS as against 68 per cent of clusters in urban areas.

Given the measure for geographical access, the utilisation of PDS can be

Table 2: Unconditional and Conditional PDS Utilisation Rates

(Per cent)

	Unconditional	Conditioned for Market Users	Conditioned for Market Users and Access
AP	57	63	64
Maharashtra	33	38	50
AP: Urban	43	45	48
Maharashtra: Urban	24	27	37
AP: Rural	62	69	69
Maharashtra: Rural	38	45	58

Note: The figures are calculated from NSS consumption survey data of 1993-94.

Table 3: Decomposition of the Differences in Utilisation Rates

	(A) Log-Difference in Utilisation Rates (as Per Cent of A)	(B) Log-Difference in Coverage Ratios (as Per Cent of A)	Log-Difference in Proportion of Grain Purchasers (as Per Cent of A)	Log-Difference in Utilisation Rates among Grain Purchasing Households with Access to the PDS (as Per Cent of A)
Entire state	0.55 (100)	.30 (51)	.05 (8)	.24 (41)
Rural areas	.478 (100)	.254 (53)	.05 (11)	.175 (36)
Urban areas	.57 (100)	.266 (47)	.06 (10)	.24 (43)

examined in only those clusters where households have access. The last column of Table 2 presents these figures. The table shows that utilisation rates in both sectors of Maharashtra increase significantly when these are conditioned for geographical access. Such conditioning leaves utilisation rates in AP unaffected because of the near universal coverage.

We use the following procedure in order to quantify the role of endowments, geographical coverage and all other factors in explaining the variation in PDS utilisation between states. Let N_i be the total number of households in state i, G_i the number of households that buy wheat or rice (from any source) in state i, C_i the number of grain purchasing households in state i that have geographical access to the PDS and P_i the number of households in state i that utilise the PDS, ie, buy wheat or rice from it. Then the unconditional ratio (P_i/N_i) can be decomposed as

$$P_i/N_i=(P_i/C_i)(C_i/G_i)(G_i/N_i) \quad (1)$$

Hence the difference in ratios between the two states can be written as

$$\begin{aligned} &\text{In}\,(P_A/N_A) - \text{In}(P_M/N_M)= \\ &\quad \text{In}[(C_A/G_A) - (C_M/G_M)]+ \\ &\quad \text{In}\,[(G_A/N_A) - (G_M/N_M)] \\ &\quad +\text{In}\;\;[(P_A/C_A) - \text{In}\,(P_M/C_M) \end{aligned} \quad (2)$$

where subscripts A and M index AP and Maharashtra respectively. The first term on the right hand side is the difference in utilisation rates due to differences in geographical coverage. The second term on the right hand side is the difference in utilisation rates due to differences in the proportion of grain purchasers. The third term is the difference in utilisation rates due to all the other factors including average income, issue price, prices of other commodities, extent of subsidy and quota. Table 3 presents the results of the decomposition. Around 50 per cent of the difference in utilisation rates is due to differences in geographical coverage, 10 per cent of the difference is due to endowments and tastes while 40 per cent of the difference in utilisation is due to other PDS characteristics and household characteristics. Thus, even if Maharashtra replicated the Andhra food subsidy programme in terms of subsidy and targeting (coverage remaining the same), the gap between the two states (at present about 20 per cent points) will at most be reduced by 10 per cent points. Similarly, other things held constant, even if Maharashtra's food subsidy programme became universal like that of AP, overall utilisation of PDS in Maharashtra will remain about 10 per cent points below that of AP.

Figure 1: PDS Use by Decile Group: Rural Sector

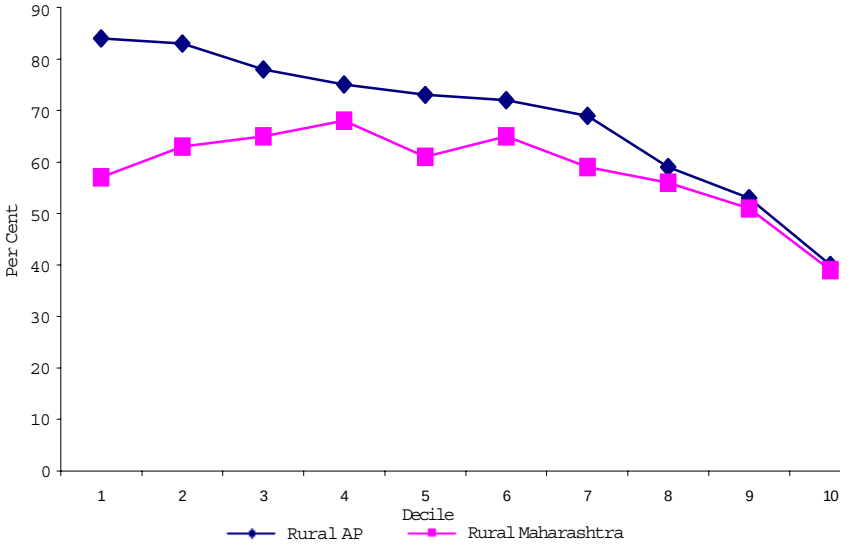
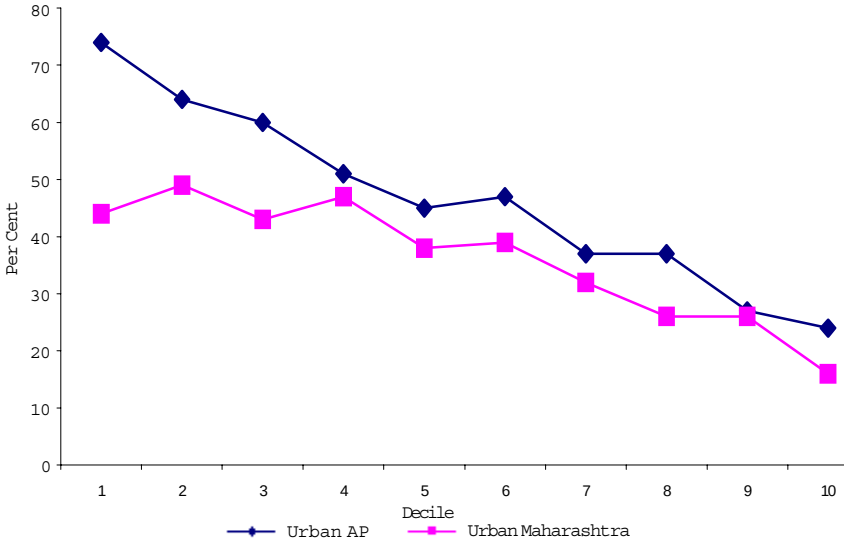


Figure 2: PDS Use by Decile Group: Urban Sector



II
Targeting in the Use of PDS

In this section, we consider the usage of PDS by various income decile groups and how it varies between the states. Our focus is on assessing the targeting performance of the PDS. There can be two kinds of targeting errors. First, the food subsidy scheme might not reach many of the poor. These are the errors of exclusion or Type 2 errors [Cornia and Stewart 1993; Hoddinot 1999]. Second, the PDS might permit access to many of the non-poor. These are the errors of inclusion or Type 1 errors.

One kind of exclusion error occurs when the poor are excluded because of lack of geographical coverage. Because of universal coverage, these errors are unimportant in AP. In Maharashtra, on the other hand, about 30 per cent of the poor (defined as the bottom 40 per cent) are excluded because of incomplete coverage. In the rest of this section, we focus on targeting errors that are for reasons other than incomplete coverage. In other words, we consider targeting errors in regions that have geographical access to the PDS. We also leave out the part of the population that for some reason or the other does not buy wheat or rice from any source.

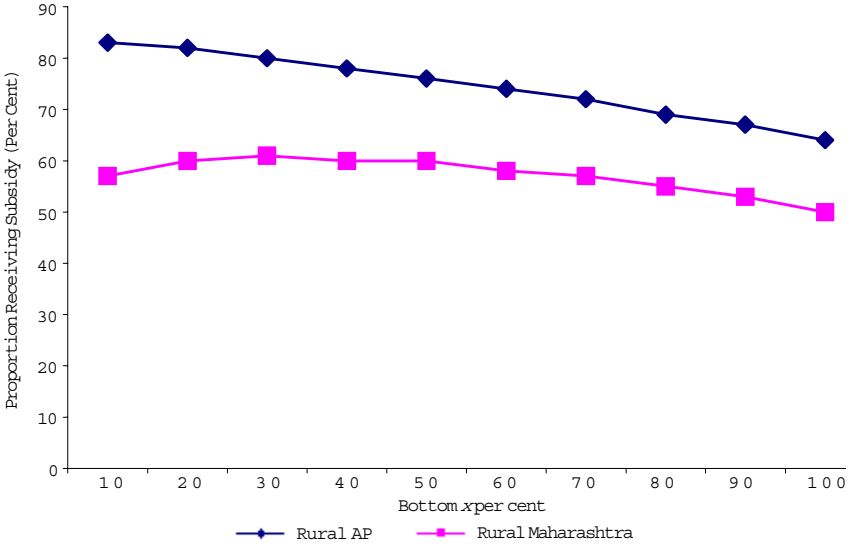
Figure 1 displays, by decile group, the proportion of rural households with access

to the PDS that buy subsidised grain in the two states. Notice that rural AP does much better than rural Maharashtra in terms of lower errors of exclusion while the errors of inclusion are comparable between the two states. The participation rate in AP is about 84 per cent in the bottom decile group and drops to 40 per cent in the top decile. In Maharashtra, the participation rates at the two ends of the income distribution are 57 per cent and 39 per cent. As a result, the AP usage curve starts well above that of Maharashtra but falls and approaches the Maharashtra curve at higher income levels. This also describes the usage of PDS by urban households in the two states (Figure 2).

A key feature of both these graphs is that at low-income levels, the AP curve is above that of Maharashtra and the gap is the greatest at the bottom decile (of 27-30 per cent points). Figure 3 plots the proportion of PDS users (rural and urban combined) in the bottom x per cent of the population where x is varied from 10 to 100 in increments of 10. As x increases, the difference between AP and Maharashtra narrows and is the smallest at $x = 100$, which is the average proportion for the population. Thus the difference in averages hides the much greater variation in the errors of exclusion between the two states.

Nonetheless, even in the lowest decile, and even in AP, 17 per cent do not use the food subsidy scheme even when it is available. The corresponding figure is 43 per cent for Maharashtra. This could be due to several reasons. First, grain from the market may be preferred to PDS grain because of higher quality and greater convenience. This accounts for the slope of the usage curve, especially in AP but is less convincing as an explanation for the lack of participation in the low-income groups. Second, some households may reckon the costs of obtaining a ration card, which entitles subsidised supplies, to be too high. This could be because of rent-seeking by administrative officials or because some households, especially in urban areas, find it tough to meet the requirement of a fixed residence. Third, since ration entitlements can be accessed only once every fortnight, the poor households may not have incomes that permit savings for even this duration. Finally, a part of the explanation as to why more of the poor in AP, relative to Maharashtra, use the PDS must surely lie in the greater subsidies offered to them. Evidence on this point is provided in the next section.

Figure 3: Targeting in the Bottom X



While Figures 1 to 3 convey information about targeting errors in the two states, they are incomplete because of the absence of quantity information. For instance, a participation rate of 100 per cent in the bottom decile groups might suggest the absence of errors of exclusion. However, this figure is not indicative of good targeting if the purchase of PDS grain by the bottom groups is minuscule. Similarly, a high participation rate among the high-income groups is not necessarily evidence of poor targeting if the quantities bought by them are small. We thus need to develop measures of targeting that are also sensitive to the quantities purchased from the public distribution system. This is what we do in the rest of this section.

Consider first the errors of exclusion or Type 2 errors. Assume that the government wishes to ensure a per capita consumption of q units to each member of the target group, say, the bottom 5 deciles. Suppose persons i and j buy less than q units from the PDS, and that j has a *lower* per capita consumption than i. Then, the welfare consequence of j's consumption shortfall from the targeted amount of q is *more* significant than the corresponding welfare loss from i's shortfall. We capture this effect through a 'rank-order weighted measure'. In particular, we divide the households into decile groups. Let q_i be the average per capita PDS consumption of grain for decile i for those who buy grain from the PDS, while p_i is the proportion of persons who use the PDS as a fraction of the grain-buying population having access to the PDS.[5] Then, the weighted average of per capita consumption for decile i is p_iq_i. Assuming that the target group is the bottom 5 deciles, we assign weights of 5, 4, 3, 2, and 1 to the average shortfalls of deciles 1, 2, 3, 4, and 5 respectively. Taking the per capita target quantity to be 4 kg per month,[6] the welfare loss from Type 2 targeting errors is computed as

$$T_2 = \sum_{i=1}^{5} r_i (4 - p_i q_i) \qquad (3)$$

where r_i is the welfare loss associated with each kg shortfall of PDS consumption from 4 kg for decile. T_2 is the aggregate welfare loss and is thus a measure of Type 2 targeting errors. Clearly, greater is T_2, greater is the welfare loss from errors of exclusion. If there were no targeting errors, T_2 would be zero.

We now describe the construction of T_1, our measure of welfare losses from errors of inclusion or Type 1 errors. Again, p_iq_i denotes the weighted average of per capita consumption of decile i. Assuming the target group to be the bottom five deciles, any consumption of PDS grain by individuals in the upper five deciles is considered to be a 'leakage'. The welfare loss associated with every unit of leakage is increasing in the income of the recipient. The measure of welfare loss is accordingly

$$T_1 = \sum_{i=6}^{10} w_i (p_i q_i - 0) \qquad (4)$$

where w_i is the social welfare loss per unit of PDS consumption of decile i. We assume $w_6 = 1$, $w_7 = 2$, $w_8 = 3$, $w_9 = 4$ and $w_{10} = 5$. As in the case of T_2, the minimum value of T_1 is zero.

The measures of welfare loss due to targeting errors are presented in Table 4.

As remarked earlier, all expenditure groups in AP use the PDS more intensively. Not surprisingly, AP has a higher error of inclusion than Maharashtra. The difference in Type 1 targeting errors is particularly striking in the rural sector – the values of T_1 for the rural sectors in AP and Maharashtra are 22.35 and 11.30 respectively. This difference is the combination of two factors. First, a higher proportion of the upper deciles in rural AP use the PDS than their counterparts in Maharashtra. Second, average per capita consumption of PDS grain by the upper deciles is significantly higher in rural AP than the corresponding figure in rural Maharashtra. The comparative estimates of T_1 in the urban sectors in the two states present a striking contrast. The magnitude of Type 1 error in urban AP (4.29) is only marginally higher than the corresponding estimate in urban Maharashtra (4.12). Although a (slightly) higher fraction of the upper deciles in urban AP use the PDS than their counterparts in urban Maharashtra, there is hardly any difference in the average per capita consumption levels of PDS grain in the two sectors. Of course, the significantly higher estimate of T_1 for rural AP means that the estimate of T_1 for the state as a whole is also much higher than the corresponding figure for Maharashtra.

The pattern of Type 2 errors or errors of exclusion is quite different. In both the rural and urban sectors, T_2 is significantly smaller in AP compared to Maharashtra. The bottom deciles consume more PDS grain than their counterparts in Maharashtra. Moreover, a significantly higher fraction of the bottom deciles utilise the PDS in AP. Since both the effects move in the same direction, the magnitude of Type 2 error is less than half for AP as a whole compared to Maharashtra. Another noticeable difference between the two states is that the estimates of T_2 in the two sectors in Maharashtra are very close –49.9 in the rural sector and 51.34 in the urban sector. In contrast, T_2 is appreciably higher in the urban sector (36.40) compared to the rural sector (20.43) in AP. Utilisation of the PDS, both in terms of the fraction buying PDS grain as well in terms of the quantities bought, amongst the bottom deciles is significantly higher in the rural sector compared to the urban sector in AP.

IV
Subsidies: Distributional Pattern and Magnitude

In this section, we discuss the pattern of subsidies provided to various decile groups in the two states through the PDS.

Suppose household h purchases q kgs of rice from the PDS at Rs d per kg. Then, the per kilogram subsidy received by this household is $(p–d)$, while the total subsidy is Rs $(p–d)q$ where p is the market price of grain that is of comparable quality to the grain purchased from the PDS. The problem is that p is not clearly identified in the data. Although the NSS consumption survey data does not report prices, it provides information on household purchases, in quantity as well as in value terms. Hence one can derive the unit value of grain purchased in the market. Parikh (1994), Radhakrishna et al (1997) and Tarozzi (2000) treat this as p.[7] But, typically, higher income households report higher unit values because of the superior quality of grain consumed by them. There is also evidence that PDS grain is usually comparable to poorer qualities of market grain [Balakrishnan and Ramaswami 1997]. The unit value derived from market purchases would, therefore, be higher than the market value of PDS grain. Since this would be especially true for higher income groups, identifying p as the unit value of market purchases exaggerates the subsidy to higher income groups.

For this reason, we considered the following two different approaches to derive a proxy for the market price of PDS grain. In the first approach, we take the market price of PDS rice (or wheat) to be the unit value prevailing at the 30th percentile of the distribution of unit values of rice (or wheat) by sub-round (i e, the quarter in which the household is surveyed). The market price, therefore, varies by sub-round and takes into account seasonal variations. In the second approach, the market price of PDS grain is taken to be the average unit value for the bottom three deciles ranked by per capita expenditure. The pattern of subsidies turns out to be very similar with either of these approaches, and our description of results is restricted to the first approach.[8]

Table 5 contains estimates of the average per capita levels of subsidy in the two states, where the averages are taken amongst the grain-buying population with access to the PDS. The most striking aspect of the table is the large difference in the levels of per capita subsidy between the two states. For the bottom half of the population, the per capita subsidy on rice in rural AP is four to eleven times larger than the per capita subsidy on rice and wheat in rural Maharashtra. For the corresponding group, the subsidies in urban AP are 3 to 7 times larger than the subsidies in Maharashtra. For the top 5 deciles, subsidies are substantially higher in rural AP while these differences are substantially smaller when comparing across urban areas. A part of this remarkable difference is explained by the fact that PDS consumption levels are smaller in Maharashtra. The average consumption levels of PDS rice and wheat are 0.61 kg and 0.63 kg respectively in Maharashtra, while the average

Table 4: Targeting Errors in AP and Maharashtra

	Andhra Pradesh			Maharashtra		
	Rural	Urban	Combined	Rural	Urban	Combined
T_1	22.35	4.29	14.35	11.30	4.12	6.92
T_2	20.42	36.40	22.29	49.90	51.34	49.61

Table 5: Average Per Capita Subsidy Levels by Decile Groups

(Rs/month)

Decile	Rural AP	Rural Maharashtra	Urban AP	Urban Maharashtra
1	6.59	0.95	7.13	1.33
2	7.02	1.27	6.26	2.04
3	7.05	1.64	6.05	1.79
4	6.88	1.34	4.92	1.82
5	6.82	0.62	4.38	0.59
6	6.74	1.57	3.47	1.60
7	7.12	1.23	2.14	1.37
8	5.44	1.33	2.24	1.07
9	5.75	1.69	0.76	0.90
10	3.76	0.82	0.03	0.29
All Deciles	6.43	1.32	4.14	1.51

Notes: For AP, the figures refer to the subsidy received on the purchase of rice from the PDS while for Maharashtra, the figures refer to the sum of the subsidies received on the purchase of rice and wheat from the PDS. The decile groups are defined with respect to the sector. The population over which the averages are taken are the grain consumers with access to the PDS.

consumption of PDS rice in AP is 2.45 kg. More importantly, the rate of subsidy, that is the difference between the PDS price and the market price, is substantially smaller in Maharashtra. The average price of PDS rice in Maharashtra is Rs 6.23 per kg, while the estimated market price averaged across seasons is Rs 7.38. Hence, the average rate of subsidy is only Rs 1.15. Contrast this with the average rate of subsidy in AP, the estimated market price of PDS rice is Rs 6.00, while the average PDS price is Rs 3.57. Hence, the rate of subsidy turns out to be as high as Rs 2.43. We have commented earlier on the significant difference in utilisation rates of the PDS in the two states. It is clear that the large difference in rates of subsidy must play a major role in explaining the pattern of utilisation rates.

In AP's urban areas, the subsidy pattern across income groups is close to ideal. The bottom decile receives the highest per capita subsidy of Rs 7.13 per month. Except for a small jump between the seventh and eighth decile, the subsidies decline with per capita expenditure and tail off to zero at the upper end of the income scale. This does not happen in the rural sector where per capita subsidies are above Rs 6 per month for up to the seventh decile. The top 3 deciles do receive less income transfers. But, unlike the pattern in the urban sector, these transfers are not negligible. These findings are consistent with the analysis of targeting errors which found errors of inclusion to be more serious in rural AP than in the urban parts of the state. In Maharashtra, subsidies do not seem to be targeted in either the urban or rural sectors. Urban subsidies decline after the sixth decile. Even such mild targeting is not to be found in rural subsidies.

The importance to households of income transfers via food subsidies can be seen by considering the ratio of subsidies received to total household expenditures. In Andhra Pradesh, this ratio is around 5 per cent for the lowest deciles while it does not exceed 1 per cent for any decile in Maharashtra. These ratios have to be judged in terms of the extent to which food subsidies can augment household incomes. For example, suppose we take 4 kgs of grain per capita per month as the desired level of supply from the PDS.[9] If the market price of this grain is *p*, food subsidies can increase per capita incomes by at most Rs 4*p* which occurs when consumers receive free supplies. In AP, depending on the season, the price of rice comparable to PDS quality varies between Rs 5.5 (in rural sector) and Rs 7 (in urban areas). The maximum income transfer is therefore about Rs 22 to Rs 28 per capita per month. In Maharashtra, the maximum income transfer varies between Rs 20 and Rs 32 depending on the sector and the combination in which wheat and rice are consumed. Seen in this light, the bottom 4 decile groups in AP receive about a quarter of the income transfers possible through the food subsidy system while in Maharashtra, food subsidies transfer to the bottom 4 deciles only about 5 per cent of the maximum possible levels.

The subsidy estimates in Table 5 are averages over the entire grain buying population with access to the PDS. They therefore include the households that do not receive any subsidy. If such households were excluded and subsidy estimates were confined to households with positive PDS purchases, then such estimates are higher. In AP, the per capita subsidy for those who receive subsidies range between Rs 8 and Rs 12 while in Maharashtra, subsidies range between Rs 1.5 and Rs 4 per person. More importantly, the upper income groups seem to obtain similar or higher benefits as the poorer households. The clue to this pattern is provided by Table 6 which presents, by decile group, the average per capita quantities purchased from the PDS among the households with positive PDS purchases. Conditional on purchase, the top deciles purchase more per capita than the bottom deciles. The per capita consumption of the bottom 4 deciles in either state and in either sector falls short of 4 kgs. On the other hand, if we consider the top 6 deciles in the rural and urban sectors of both states, the per capita consumption is 4 kgs or greater in 15 of the 24 cases.

There could be at least two reasons for the regressive nature of PDS purchases. First, since poorer households tend to be larger, their per capita entitlements and hence purchases are correspondingly lower. Second, the pattern could be due to an income effect, i e, the poor households are so poor that they are not able to purchase their entire entitlement. This explanation is not fully satisfactory because if it were true, we would not observe poor households (that are unable to exhaust their ration entitlement) buy any grain from the market given that PDS grain is cheaper. But poor households do buy grain from the market even if these purchases are smaller in magnitude than the quantities purchased by richer households. In AP, as many as 60 per cent of households in the bottom 4 deciles buy grain both from the market and the PDS. Only 13 per cent of households in this group buy solely from the PDS.[10] Therefore, the income effect is not the reason why poor households do not use their full entitlements.

However, low incomes might still matter through the liquidity effect. Poor households may be able to buy only small

Table 6: Average Per Capita Purchases from PDS

(Kgs/month)

Decile	Rural AP	Rural Maharashtra	Urban AP	Urban Maharashtra
1	3.31	1.39	3.38	2.06
2	3.59	1.55	3.67	2.71
3	3.83	2.04	3.9	3.2
4	3.93	1.65	3.1	3.25
5	4.08	2.02	4.62	3.37
6	4.28	2.56	4.71	3.4
7	4.58	2.44	5.15	4.01
8	4.3	2.83	5.06	3.99
9	4.29	3.32	4.13	4.01
10	4.91	2.7	7.48	3.32
All Deciles	3.96	2.18	4.03	3.14

Notes: The averages are for the population of PDS users. The figures for AP relates to rice purchases while the Maharashtra figures are the sum of rice and wheat purchases. The decile groups are defined with respect to the sector.

Table 7: Cost of Providing One Rupee of Subsidy

(In Rs)

State/Target Group	Entire Population (1)	Bottom 40 Per Cent (2)	Bottom 30 Per Cent (3)	Bottom 20 Per Cent (4)
Andhra Pradesh	1.71	3.14	4.05	5.81
Maharashtra	1.82	4.02	5.72	9.05

Note: These calculations are based on central government expenditures as the product of state's PDS offtake and the per unit FCI subsidy.

quantities of grain on any single day. So some of their market dependence might stem from their inability to buy their entire ration entitlement in bulk.

V
Cost-Effectiveness of Food Subsidies

In the earlier section, we examined the magnitude of income transfers received by various income deciles in the two states. Expenditures on food subsidies can be obtained from government documents. Putting the two together, one can calculate the cost of a rupee of income transfer to a member of a target group as the ratio of the government's expenditures on the food subsidy scheme to the total income transfer received by the target group.[11] We consider different choices of the target group – the entire population, the bottom 40 per cent, the bottom 30 per cent and the bottom 20 per cent. The results are summarised in Table 7.

To illustrate how these numbers are calculated, consider the cost of providing a rupee of income transfer to a consumer in AP. For AP as a whole, the average per capita rice subsidy works out to be Rs 5.48 per month.[12] Assuming the population in 1993/94 to be 69 million, the total annual income transfer was Rs 4,537 million.[13] The expenditure by the state government on the rice subsidy in 1993/94 was Rs 4,193 million [Radhakrishna et al 1997: Table 2.2]. The central government's food subsidy expenditures are calculated by multiplying the PDS offtake (or the 'lifting') with the per unit FCI subsidy which in turn is the difference between the economic cost and the sales realisation on a unit of grain [Radhakrishna et al 1997: Tables 3.5 and Tables 3.6]. Computed in this manner, the central government spent Rs 3,585 million on the AP rice subsidy scheme in 1993-94. Hence the cost to the government (central and state combined) of providing one rupee of rice subsidy was Rs 1.71 in 1993-94.[14] If we regard the bottom 4 expenditure deciles to be the target group, the total income transfer to this group was Rs 2,445 million or about 55 per cent of the total transfer. Therefore, the cost of transferring a rupee to the target group via the food subsidy was Rs 3.14.

We carried out similar calculations for Maharashtra. The statewide average per capita subsidy (on wheat and rice) was Rs 1.053 per month. For a population of the size of 82 million, the total annual income transfer works out to Rs 1,036 million.[15] During the same year, the expenditure of the central government on subsidy to wheat and rice, computed as the product of PDS offtake and FCI subsidy, was Rs 1,883 million [Radhakrishna et al 1997: Tables 3.5 and 3.6]. While information on state government expenditures is not available, they are unlikely to be significant. We therefore use the central government expenditures as the cost of delivering subsidies to rice and wheat in Maharashtra. In 1993-94, the cost of providing one rupee of subsidy was Rs 1.82 and the cost of providing a rupee subsidy to the target group (of bottom 40 per cent) works out to be Rs 4.02. Notice in Table 7, that the Maharashtra programme is somewhat costlier than the AP programme whatever be the definition of the target group. The differential in costs is particularly sharp for the bottom two deciles.

It is well known that some portion of PDS supplies is leaked into the market [Ahluwalia 1993]. Larger are these diversions, greater will the costs of using food subsidies to transfer income to target groups. We compared the average per capita PDS offtake (from FCI figures) to the average per capita consumption of PDS grain (from the NSS consumption survey) in order to quantify the extent of leakages. The results are presented in Table 8. Notice that leakages in Maharashtra are higher than for AP. Nearly 30 per cent of rice supplies in Maharashtra do not reach PDS consumers. This must be an important reason explaining why income transfers are so costly in Maharashtra.

The other reason why the cost-effectiveness ratio is greater than 1 might be that the government is inefficient, relative to private trade, in delivering foodgrains through the public distribution system. To quantify the relative contributions of leakages and inefficiency in the costs of the food subsidy system, consider the following decomposition. We can write the total cost of food subsidy (*CFS*) in a state as the sum of the cost borne by the central government (*CGS*) and the state government (*SGS*). Then, $CGS = (ec-sr)Q_1$, where *ec* is the per unit cost of procurement, storage, distribution, wastage incurred by the FCI, *sr* is the average sales realisation received by the FCI, and Q_1 is the total offtake of grain by the state from the FCI. Moreover, $SGS = (sr + m - P_1)Q_1$, where *m* is the per unit distribution cost incurred by the state, and P_1 is the PDS price paid by households. Letting P_2 denote the market price of grain comparable in quality to PDS grain and Q_2 the total quantity of PDS grain reaching consumers, we can write *CFS* as follows:

$$CFS = (ec-sr)Q_1 + (sr+m-P_1)\,Q_1 = (ec+m-P_1)Q_1$$

which can be decomposed as

$$CFS = (ec+m-P_2)Q_2 + (P_2-P_1)Q_2 + (ec+m-P_1)(Q_1-Q_2) \quad (5)$$

This decomposition has an interesting interpretation. Since $(ec+m)$ is the cost of selling a unit of PDS grain to the consumer, $(ec+m-P_2)$ is a measure of the relative inefficiency associated with the public distribution system. So, the first term in (5) is a proxy for the total cost of inefficiency. However, a caveat is in order. The measure of economic cost reported by the FCI is an average figure for the entire country. Of course, the FCI incurs a lower distribution cost in a rice-producing state such as AP and a correspondingly higher distribution cost in states like Maharashtra. So, the actual economic cost for a rice-producing state is lower than the average figure used in the calculation. Thus, our measure of the cost of inefficiency is probably biased upwards for AP and biased downwards for Maharashtra. Noting that (P_2-P_1) is the per unit subsidy obtained by consumers from the PDS, the second term measures the total income transfer achieved by the PDS in the particular state. Finally, since (Q_1-Q_2) is the quantity of PDS grain that is lifted by the state but does not reach the consumers, the last term clearly is the cost incurred due to leakage.

Table 9 below presents estimates of these costs for AP and Maharashtra.[16] Note that the estimates are combined estimates for both rice and wheat. The absolute figures reflect the fact that the scale of the PDS is much larger in Andhra Pradesh than in

Table 8: Leakage from the Public Distribution System: Kgs for the Year 1993-94

State: Commodity	(A) Average Per Capita Offtake	(B) Average Per Capita Consumption	Leakage: (A–B/A) x100 (Per Cent)
Andhra Pradesh: rice	31.34	26.76	14.6
Maharashtra: rice	7.00	4.92	29.7
Maharashtra: wheat	6.40	5.16	19.4

Notes: The figures in column A are from Table 3.7 of Radhakrishna et al (1997). The figures in column B are 12 times the monthly average per capita consumption figures computed from NSS data.

Maharashtra – a fact on which we have commented earlier. What is more interesting is the composition of total subsidy costs in the two states. While there is not much to choose between the two states in terms of income transfers, the cost of leakage is relatively higher in Maharashtra. Conversely, the relative cost of inefficiency is higher in AP. Of course, this comparison is subject to the qualification made earlier about the problem in measuring inefficiency.

VI
Summary and Conclusion

In terms of expenditures, the AP rice subsidy scheme is a little more than 3 times larger than the Maharashtra food subsidy programme. In terms of quantities of PDS offtake, the AP programme is twice as large as the Maharashtra programme (2.2 million tonnes of rice to 1.1 million tonnes of wheat and rice). What have been the consequences to consumers?

A significantly greater proportion of the population uses the PDS in AP as compared to Maharashtra. We found about 50 per cent of the difference in utilisation rates was due to differences in geographical coverage. The AP programme reaches all parts of the state while the Maharashtra PDS leaves out nearly 30 per cent of the population. Differences in household and PDS characteristics accounted for most of the remainder variation in utilisation rates.

Considered, in every possible way, the poor in AP are greater beneficiaries than their counterparts in Maharashtra. While the coverage of the programme is universal in AP, nearly 30 per cent of the poor in Maharashtra are excluded because of lack of coverage. When comparison is restricted to the poor with access, markedly less use the PDS in Maharashtra. Errors of exclusion are much lower in AP and especially so in its rural parts. The poor in AP also receive a substantially higher subsidy per capita than the poor in Maharashtra. If one were to adopt a conservative norm of 4 kgs of grain per capita as the desired level of PDS supply to the target groups, then we found that the bottom 4 deciles in AP receive about a quarter of the maximum possible income that could be transferred by a food subsidy scheme. The corresponding contribution by the Maharashtra PDS is less than 6 per cent.

As regards the non-poor, they receive sizeable subsidy benefits in rural AP. Errors of inclusion are highest in this sector of AP. The urban areas are different. The higher income groups receive negligible subsidies and errors of inclusion are low. In Maharashtra too, the errors of inclusion are lower in urban areas. The non-poor in urban and rural Maharashtra receive subsidies of about the same magnitude as the poor. In other words, the PDS delivers insignificant subsidies to all income groups in Maharashtra.

From the point of view of targeting, urban AP is the only sector that appears close to ideal. How was this achieved? Was it due to the targeting scheme used by the state government? That seems unlikely as the pattern of PDS purchases by PDS users is in fact regressive. Conditional on purchase, higher income groups everywhere including urban AP buy more PDS grain than the poor. The PDS price paid by higher income groups is not substantially higher than the price paid by the poorer groups. The targeting we observe in the subsidies received by various decile groups in AP must then be due to the lower utilisation of the PDS by higher income groups as compared to the poor. In other words, targeting was achieved because the relatively rich voluntarily opt out of the programme. This could be because of a number of reasons such as transactions costs and preference for higher quality grain available from private traders.

We conclude with some observations regarding the policy implications of our findings. The debate about the PDS does not question the need for a safety net for the poor. But what demands scrutiny is whether the PDS is an efficient mechanism for redistribution. As we found, the cost of delivering a rupee of subsidy to the bottom 40 per cent is more than Rs 3 in both states. In recent years, the response of the central government has been to introduce income targeting in the PDS. By excluding the non-poor, the goal is to lower the cost of transferring subsidies to the poor. While the goal is understandable, the strategy is questionable.

The new programme called targeted PDS, makes a distinction between households that are above and below the poverty line. Households below the poverty line receive greater foodgrains allocations and a greater subsidy. It is the task of state governments to identify and distinguish between below poverty line and above poverty line households. Since many of the poor receive incomes from activities that are irregular, seasonal and unrecorded, the task seems formidable if not impossible. Indeed, if such targeting were possible, then direct income transfers are superior to food subsidies. Besides the errors of identification, the task of identifying beneficiaries is not costless either. It is not obvious at all, therefore, that the new strategy will improve the efficiency of food subsidies in reaching the poor.

The appeal of self-targeting interventions arises from these difficulties. If subsidies are restricted to inferior goods, the relatively rich will voluntarily opt out of the programme and no costly and necessarily imperfect administrative mechanism is required to implement targeting. This way a self-targeting intervention could minimise errors of inclusion. Indeed, as we found, this is precisely what seems to have happened in urban AP, where the relatively rich have self-selected out of the rice subsidy programme presumably because of preference for higher quality. Other options which have been suggested include commodity-based targeting in which the subsidy is restricted to commodities consumed primarily by the poorer households,[17] or to select beneficiaries contingent upon them participating in another activity[18].

Our findings also suggest another direction for policy reform, namely, in improving the operational efficiency of the PDS. Table 7 suggests ample scope for reforms in this area. Indeed, savings from greater operational efficiency measure up to the savings from perfect targeting. To see this, we compare improvements in cost-efficiency from two hypothetical experiments. In the first experiment, consider the cost-efficiency with perfect targeting, everything else remaining unchanged. If the target group is the bottom 40 per cent, then assume this group receives all the subsi-

Table 9: Decomposition of Cost of Subsidies

	Andhra Pradesh		Maharashtra	
	Rs Million	Per Cent of Total	Rs Million	Per Cent of Total
Cost of inefficiency	2058	26.5	295	16
Income transfer	4537	58.5	1036	56
Cost of leakage	1161	15	529	28
Total cost of subsidy	7778	100	1883	100

Note: The individual components do not add up to the total cost because of rounding-off errors.

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dies. Then the cost-effectiveness of reaching this group under perfect targeting will be given by the numbers in the first column of Table 7, i e, Rs 1.71 in AP and Rs 1.82 in Maharashtra. In the second experiment, assume that the procurement-cum-food subsidy regime becomes so efficient that it costs only one rupee to transfer one rupee of subsidy to the state's population. In other words, the cost-effectiveness ratio in the first columns of Table 7 becomes 1. Then, with no improvements in targeting, the cost of providing a rupee of subsidy to the bottom 40 per cent would be Rs 1.84 and Rs 2.21 in AP and Maharashtra respectively (obtained by dividing the figure in the second column by the figure in the first column of Table 7).

Although neither of these hypothetical scenarios are realistic, it does seem more feasible to strive for greater operational efficiency than to implement targeting schemes which require a great deal of information on household characteristics. The government must consider alternative institutional arrangements for delivering food cheaply. These could include food stamps and greater involvement of private agencies in the procurement and distribution of subsidised grain. Combining these institutional reforms with several self-targeted schemes seems the best way to maximise the efficiency of the PDS in distributing subsidies to the poor. EPW

Notes

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1 The PDS costs about 0.5 per cent of GDP and 6 per cent of the central government's revenue.

2 Broadly speaking, in Parikh's study, the PDS was virtually absent in Punjab, Haryana, UP, Bihar and Orissa. The below par states are Manipur, Rajasthan, MP, West Bengal, Sikkim, and Assam. The average states are Gujarat and Maharashtra. Better performers are the southern states with Kerala as the top performer. The other good performers are Tripura, Goa and Mizoram.

3 Ration quotas are fixed according to household size, age composition and a measure of income (in AP). However, in practice, these quotas may overstate the effective bound on PDS purchases as consumers may be turned away due to non-arrival of PDS supplies. While the NSS data contains information on purchases from the PDS, it does not tell us whether these purchases were less or equal to the effective bound.

4 Previous studies that have measured access by usage include Ahluwalia (1993), Dev and Suryanarayana (1991), and Howes and Jha (1992).

5 In AP, q_i refers to the consumption of PDS rice, while in Maharashtra it is the sum of PDS consumption of rice and wheat.

6 The choice of the per capita target quantity makes no difference to the ordinal comparisons of welfare losses between states. Our choice of 4 kgs was meant to approximate the targets implicit in the AP programme where households were entitled to 5 kilograms per capita subject to a maximum of 20 kgs. Since the average household size is between 4 and 5, the average individual entitlement works out to be between 4 and 5 kgs.

7 The method fails for households that record zero consumption of market grain. For such households, the market price is imputed by some procedure.

8 A third approach might be to allow for regional variation in the market price of PDS grain. This can be done by considering the 10th percentile (such as the median or the 30th percentile) of the distribution of unit values within a cluster as the market price of the PDS grain for all households within that cluster. However, as richer households tend to belong to clusters that are rich as well, the difference in prices between clusters is probably due to quality considerations as well.

9 As noted earlier, the 4 kg norm is implicit in official ration quotas. Since the average per capita consumption of cereals in lower decile groups is about 11-13 kgs per month, the 4 kg entitlement is about one-third of consumption.

10 In Maharashtra, where PDS coverage is less, the proportion of households in the bottom 40 per cent that depend entirely on the PDS is 13 per cent while 25 per cent of households buy from both sources.

11 For an analysis along these lines for All-India and Andhra Pradesh, see Radhakrishna et al (1997). They use the data from the 42nd round survey of the NSS concerning the utilisation of PDS.

12 These averages are for the entire population in the state and are therefore different from the figures reported in Table 5.

13 From the NSS data, the population estimate for AP is 62 million while the census figure is 66 million in 1991. We therefore use the census figure and approximate the 1993-94 population as 4 per cent higher than in 1991.

14 Using somewhat different procedures for the estimation of per capita subsidy, Radhakrishna et al (1997) estimated the cost of providing a rupee of rice subsidy in AP to be Rs 1.75 in 1986-87.

15 Like in AP, the NSS population estimate of 72 million is an undercount of the census figures. The census counts the Maharashtra population in 1991 as 79 million. We assume the population in 1993-94 is larger than the census figure by 4 per cent.

16 The per unit distribution cost is calculated from the relation $SGS = (ec + m - P_1)Q_1$. The price at which leaked PDS grain is sold to be the lowest PDS price observed in the data.

17 Using the 1993-94 NSS consumption survey, Dutta and Ramaswami (2000) analyse the welfare consequences of reducing the subsidy on rice and wheat and introducing instead a subsidy on coarse cereals. They find such a policy to be welfare improving for Maharashtra because of greater benefits to the poor.

18 See Radhakrishnan et al (1997): for a discussion of the experience of other countries in running self-targeted programmes like school feeding and clinic-based nutrition supplements.

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