

**Food Subsidy, Income Transfer and the Poor**  
**A Comparative Analysis of the Public Distribution System**  
**in India's States\***

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KEYWORDS: Targeted Public Distribution System, Food subsidy, Targeting Errors.

JEL Classification Code: D12, D63, H24, H42.

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\* We thank anonymous referees for their helpful comments and the editor for encouragement. We gratefully acknowledge financial support from Australian Research Council–AusAID Linkage grant LP0775444. We are also thankful to Raj Bhatia for his excellent statistical support. The usual caveat applies.

## **ABSTRACT**

The Targeted Public Distribution System (TPDS) — the largest food subsidy programme in India — has been a dismal failure in targeting the poor. The present paper examines its performance in three Indian states — Andhra Pradesh, Maharashtra and Rajasthan, based on primary data collected for this study. As real income transfers through food price subsidies are a tiny fraction of expenditure per person under this scheme, a contribution of the present study is to model determinants of real income transfers through subsidised wheat, rice and sugar. The analysis throws new light on how income transfers vary with economic status of a household, inequality in the distribution of land in a village, amount of food price subsidy, transaction costs of buying from ‘fair price shops’ (FPS), and supply shortages. The policy implications of these results are profound. Desperate measures such as a universal food subsidy enshrined in a proposed National Food Security Act are rejected on the grounds that the enormous leakages and wastage under the present TPDS would only get worse. Assertions that a universal food subsidy is the only option consistent with the right to food are rejected as mistaken, as the latter could be interpreted as a right to a right, or, more specifically, as a right to sensible livelihood expansion and price stabilisation policies.

## I. Introduction and Background

Although rapid economic growth has led to steady progress in reducing poverty, malnutrition remains widespread, and ensuring food access for the poor remains a priority for the government. Total expenditures on food subsidies amounted to USD12.4 billion or around 1 per cent of GDP in 2009. The largest food subsidy programme is the Targeted Public Distribution System (TPDS or PDS in short), which provides households access to subsidised food staples (wheat, rice) and other items (edible oils, kerosene, sugar) (OECD, 2011; Svedberg, 2010). In addition to being a food subsidy programme, the PDS serves as a minimum support price mechanism for farmers. Other special programmes include the Mid-Day Meals Scheme, which offers a hot meal to all children attending government-funded elementary schools.

The PDS, till 1992, was a general entitlement scheme for all consumers without any specific target. In 1992, the revamped public distribution system (RPDS) was launched, without any specific target, to ensure effective reach of the PDS to remote and inaccessible areas. Although the food subsidy under the PDS was large, its effects on the poor were minimal (Radhakrishna and Subbarao, 1997).<sup>1</sup> Their analysis of 1986–87 household data showed that per capita gains to rural consumers from all consumer subsidies (food and non-food) were just Rs 2 per month, or 2.7 per cent of per capita expenditures. The effects, therefore, on poverty and nutrition were negligible.

In response to the growing fiscal deficit and concerns for reducing subsidies and increased expenditures, the government redesigned the PDS in 1997. The new programme, Targeted Public Distribution System (TPDS), aimed to reduce subsidies to the non-poor and enhance those to the poor. Its salient features are summarised below, based on Bhalotra (2004), Kochar (2005), Svedberg (2010), Jha and Ramaswami (2010), and Planning Commission (2008):

- (i) It distinguishes between households that fall below the poverty line (BPL households) and those above the official state-specific poverty lines (APL). State governments are responsible for identifying the poor households, using multiple criteria including indicators such as land operated/owned, ownership of TVs, motorcycles and other durables, among others.

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<sup>1</sup> Food subsidy is defined as the excess of market price of a commodity and the subsidized prices multiplied by the amount sold through the PDS.

- (ii) Foodgrains are purchased by the central government, through the Food Corporation of India (FCI), at predetermined minimum support prices (MSP). The government also determines a uniform central issue price at which foodgrains are sold by FCI to state governments for distribution through the PDS.
- (iii) The TPDS initially fixed the BPL household entitlements to 10 kg of foodgrains per month and gradually raised them to 35 kg. Since 2000–01, BPL households are entitled to purchase rice from fair price shops (FPS) for Rs 5.65 per kg and wheat for Rs 4.15.
- (iv) APL allocations varied across states and were calculated as the difference between the state's allocation of foodgrains and BPL allotments. State allocations are determined by the central government on the basis of last 10 years' average take-up of subsidised foodgrains.
- (v) As market prices rose more than subsidised prices, there were substantial increases in BPL subsidies.
- (vi) As of 2002, a new TPDS window was opened, the Antyodaya Anna Yojana (AAY), under which the poorest of the poor are given the option to buy food at even more subsidised prices. The prices for AAY households are Rs 3 per kg of rice and Rs 2 per kg of wheat, respectively (Svedberg, 2010).

*(a) TPDS, Nutrition and Poverty*

A brief and selective review of recent, important contributions is given below.

Kochar (2005) offers an insightful analysis of the nutritional impact of TPDS. Her analysis confirms a positive and significant effect of foodgrain subsidies on caloric intake. However, the magnitude of this effect is small. The elasticity of caloric intake to the foodgrain subsidy is 0.06. This is substantially lower than available estimates of the expenditure elasticity of caloric intake for low income households — an average of 0.3 (Strauss and Thomas, 1995).

Targeting did raise the subsidy to the poor to a level that should have resulted in a substantially higher caloric intake even with a low elasticity of 0.06. The value of the PDS monthly wheat subsidy rose from Rs 7 per BPL household in 1993 to Rs 48 by April 2000. Assuming a slightly higher elasticity of 0.08, this 586 per cent increase in the PDS subsidy should have raised the BPL caloric intake by 65 per cent. But the actual increase over the period 1993–97 was marginal, from 1933 calories to 1964 per person/day.

The difference between the actual increase in caloric consumption and the predicted increase at the full entitlement reflects the difference between PDS purchases and entitlements, particularly among poor households. In fact, over the period 1993–99, the value of foodgrain subsidies received by poor households fell from 15 per cent to 11 per cent of their entitlements. This raises the issue whether a targeted programme that aims to enhance the benefits to the poor while restricting them to the non-poor adversely affects the off-take by the poor relative to the same entitlements to all under a universal programme.<sup>2</sup>

Kochar (2005) argues that the relationship between profits and the number of customers generates a profit maximising level of procurement by FPS owners.<sup>3</sup> As the optimal amount of FPS procurement falls with a decline in the number of customers, the change to a targeted programme discourages them from holding PDS stocks, thus limiting supply to BPL households. An implication is that the quantity of PDS foodgrains to BPL households and hence their take-up rates vary with the value of the programme to the non-poor. Our analysis supports an alternative specification that relies on the number of BPL households and distance to the nearest town. But more on this later.

The empirical analysis compares a uniform policy that gives all households the same entitlement and a targeted policy that increases BPL entitlements but at the expense of APL entitlements. The results confirm the superiority of the uniform policy in improving off-take by the poor. This, however, does not confront the issue of huge diversions from FPS to the open market. As argued later, nothing short of a drastic overhaul of the TPDS, but with the same outlay, has the potential of targeting benefits better to the poor. Universalising the food subsidy is escapist and has feeble empirical support.

Using an innovative methodology and a survey carried out by NCAER, Bhalotra (2004) demonstrates that the entire food subsidy is spent on increases in food quantity (or quality). No evidence is found of significant gender differences amongst children in the allocation of food or the food subsidy. Food expenditures have a significant impact on child health, whether measured as height- or weight-for-age. Given food expenditure, income has no significant effect. The impact of food expenditure on child health tends to be larger for boys than girls and larger amongst the non-poor than amongst the poor.

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<sup>2</sup> For a recent, emphatic endorsement of this view, see Himanshu and Sen (2011). For a critique, see Gaiha et al. (2011).

<sup>3</sup> Government regulates FPS owners by stipulating the maximum amount they can sell and the profit margin. As a result, their profits depend on the number of customers.

By far the most comprehensive analysis is Svedberg (2010). He draws pointed attention to minimal benefits to the target groups. The main points of this study are summarised below.

While the BPL and AAY cardholders are allowed to buy 35 kg of subsidised grains per month, the actual purchase is just 14.7 kg in rural areas and 17.4 kg in urban areas. According to the NSSO 2004–05 survey, only 37.6 per cent of the rural households below the poverty line have BPL cards (the corresponding figure is 25.7 per cent for urban areas). The reasons include, among others, long distances to a fair price shop, irregular availability of grains in these shops, participants not being allowed to buy grains in small instalments, low quality of grains offered, preference for local grain variety and small difference between TPDS and market prices. As a result, the actual subsidy received by the poor is extremely low — less than Rs. 4 per person. This is about 12–15 per cent of what the income transfer would have been had the system been well targeted, and had the households purchased the entire ration allocated to them. The income boosts are 1.4 per cent in rural areas and 0.9 per cent in urban areas with the TPDS, but had the system worked without flaws, the income boosts would have been 7.4 per cent and 5.4 per cent for rural and urban areas, respectively.

The poverty impacts were also considerably lower than what would have been had the system worked efficiently. Confining to the income gap measure, based on the NSS data for 2004–05, the estimated gap was 20.2 per cent in both rural and urban areas, implying that the monthly per capita expenditure (MPCE) for the average poor household fell short of the poverty line by 20.2 per cent. The reduction in income gap is about 1 per cent as a result of the TPDS subsidy, as against one-third of the actual gap had the system worked without any exclusionary error and full utilisation of entitlements.

The extent of leakages is substantial. More than one third (36.7 per cent) of the subsidised grain intended for poor households ends up as sales to non poor households. About 10 per cent of all grains are spoilt during storage and transportation. The Planning Commission (2008) reports that 58 per cent of the subsidised foodgrains does not reach BPL families because of identification errors, non transparent operations and unethical practices in the implementation of TDPS. Add to it the high cost of handling foodgrains, and the government ends up spending Rs 8.5 to transfer one rupee to the poor.

*(b) Profitability, Corruption and Diversion*

Khera (2011) offers a detailed analysis of profitability of FPS, forms of corruption at different stages and diversion of PDS supplies to open markets. Although restricted to a sample of 388 households in 8 villages in Rajasthan in 2002–03, many of the findings are new and insightful while some corroborate those of others. The main findings on access and utilisation of PDS quota are summarised below.

One-third of sample households in Rajasthan have access to the PDS. Among those with access to the PDS (the BPL households or BPL+AAY cardholders), utilisation levels are low both in terms of proportion of households buying some grain from the PDS as also in terms of quantities purchased. Barely 13 per cent of BPL households availed of the full entitlement. Worse, about one-third of the households did not buy anything from the PDS. The average bought by those among the buyers was 12.6 kg (as against an entitlement of 35 kg). As long as the difference between market price and PDS wheat price is between Rs 2.6–2.9/kg, BPL households buy more from the PDS but when the price difference is larger, BPL purchases are lower as supply constraint kicks in.<sup>4</sup>

The more interesting and important contribution of this study is to highlight low profitability of FPS, corruption at different levels and extent of diversion of PDS supplies to open markets. These aspects are briefly reviewed below.

Estimates of diversion of PDS supplies, based on comparison of off-take data from the Ministry of Food and Consumer Affairs, Government of India, and consumption data from NSS (61<sup>st</sup> round), are alarmingly high. Taking these estimates at face value, two-fifths of the official PDS off-take was diverted. Less than one-fifth of rice was diverted compared with more than two-thirds of wheat. There is also a clear north–south divide in these diversions. In mainly rice eating southern states, the proportion of foodgrains diverted ranged from 11–48 per cent. Wheat eating states concentrated in the north had diversions ranging from 43–88 per cent. But there are *within-region* variations as well depending on how vociferous the consumers are — an unverified conjecture in Khera (2011).

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<sup>4</sup> This is not conclusively established as the supply effect is not identified in the wheat (tobit) regression. What is also intriguing are quantile regression results. For the 25<sup>th</sup> quantile, none of the regression coefficients are significant (including price difference). The price coefficients are not significant in the median regression either. It is only in the regression on the 75<sup>th</sup> percentile that the price difference coefficients are significant. The inconsistencies between the tobit and quantile regressions is worrying as the supply hypothesis validation in the former is rejected in the latter.

Wheat diversions for FPS are very profitable. The shopkeeper gets a paltry margin of 7 paise per kg of wheat sold to a BPL household, as compared with a margin of Rs 1.97 for selling this amount in the open market and a much higher margin of Rs 4.50 per kg of Antyodaya wheat. An honest FPS earns no more than Rs 100 per month while on certain assumptions of amounts diverted the profit is Rs 7972 (net of transportation costs). Hence the incentive to cheat is irresistible.

Corruption is rampant in obtaining a licence; commissions are paid to FCI officials for expediting supplies; and amounts supplied are frequently lower than recorded. BPL consumers are often turned away on grounds of inadequate supplies; quality sold is abysmal; and buying quotas in installments is discouraged.

Under TPDS, low margins are compounded by shrinkage of volumes.

*(c) Objective*

The objective of the present paper is to examine the reasons for low real income transfers through TPDS in three states: Andhra Pradesh, Maharashtra and Rajasthan. In line with the concerns distilled from recent literature, our analysis focuses on variation in real income transfers through subsidised wheat, rice and sugar in these states. These are associated with poverty of a household, demographic characteristics, transaction costs of buying from PDS, food price subsidy and (proximate) measures of supply constraints. The analysis is based on primary data collected by us as part of a larger project on social safety nets and nutrition in India.

The plan of this paper is as follows. Section II briefly describes the data and methodology. Section III presents results on the basic profile of TPDS in Andhra Pradesh, Maharashtra and Rajasthan and provides estimates of the subsidy implicit in the TPDS scheme. Section IV provides results of the Tobit estimation and section V concludes.

## **II. Data and Methodology**

The present paper draws upon primary household data drawn from three Indian states: Rajasthan, Andhra Pradesh and Maharashtra. The data were collected during 2007–08. The sample survey was designed to be a representative one for the following reasons. First, a list of National Rural Employment Guarantee (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 (AP) and Maharashtra. The next step proceeded as follows. In the case of Rajasthan, for example, three villages were randomly selected from each district, followed by a random selection of households. Twenty five households were selected from each of twenty villages spread over three districts. In AP 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. Apart from household level information individuals within households were also interviewed. The data include information on caste, occupation, landholdings, household size, NREG participation, type of ration card, and TPDS participation. The number of individuals interviewed for Rajasthan, AP, and Maharashtra were, respectively, 2664, 2190, and 2270.

#### *Definition and Methodology*

PDS price for village  $v$  for food item  $j$  (e.g. wheat, rice, sugar),  $P_{vj}$ , is defined as

$$P_{vj} = \exp\left(\frac{\sum_{i=1}^n \alpha_{vij} \log P_{vij}}{\sum_{i=1}^n \alpha_{vij}}\right) \text{ where}$$

$\alpha_{vij}$  = expenditure on food item  $j$  by household  $i$  of village  $v$

$$\sum_{i=1}^n \alpha_{vij} = \text{Total PDS expenditure on food item } j \text{ by all households in village } v$$

$P_{vij}$  = Price per unit quantity paid by household  $i$  of village  $v$  on food item  $j$  under TPDS

$n$  = number of households in village  $v$

In a similar manner we also compute market price. We then compute the excess of market price over PDS price for village  $v$  for food item  $j$  =

(Market price – PDS price) \* 100 / Market price.

Real income transfer through PDS is computed separately for each of the three food commodities by multiplying the (Market price – PDS price) $_{vij}$  x  $q_{vij}$  (=quantity of  $j$ th food item bought by  $i$ th household in village  $v$  under TPDS).

*TPDS participation:* A household is said to be participating in TPDS if the household bought some quantities of rice or wheat or sugar from a fair price shop (FPS) in 2007.

Stochastic dominance comparisons of per capita monthly expenditures of participants and non-participants are made by examining the cumulative distribution functions (CDF) of the per capita monthly household expenditure. We also use cross-tabulations to understand the distribution of waiting times for TPDS grain as well as the distribution of subsidy on foodgrain bought through the TPDS scheme.

#### *Tobit Analysis*

In principle, a two-step Heckman procedure is appropriate. In the first step, a probit is estimated to assess the determinants of probability of participation in TPDS. In the next step, real income transfers through subsidised purchase of each of the three items under TPDS are regressed on factors associated with them. Our experiments with the Heckman procedure consistently yielded a non significant  $\lambda$  (inverse Mills ratio), implying that real income transfers could be analysed without the sample selection correction<sup>5</sup>.

As not all households buy under the TPDS, in many cases there are zero real income transfers through subsidised food. Hence a Tobit specification is appropriate to examine the determinants of real income transfers through wheat, rice and sugar (Greene, 2003). The marginal effect (slope) is based on the conditional expectation  $E(y|y>0, \mathbf{x})$ , where  $y$  is the dependent variable and  $\mathbf{x}$  is a vector of explanatory variables<sup>6</sup>.

Our specification of explanatory variables focuses on three sets of variables: one relates to the economic status of a household. As entitlements of foodgrains (wheat and rice) vary with whether a household is a BPL (including AAY) card holder, it would have been appropriate to use this characteristic as an explanatory variable. However, this posed a problem as most of those with access to the TPDS in Andhra Pradesh, for example, were, in fact, BPL card holders. Instead, we decided to use land-owned (an exclusionary criterion under BPL classification when it exceeds 5 acres) as a measure of a household's economic status. Another set of variables is demographic, comprising household size, and its composition (number of male and female adults). While higher land-owned is hypothesized to lower the demand for the food commodities in question, size and number of adults in a household are likely to raise it.

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<sup>5</sup> Details will be furnished on request.

<sup>6</sup> Marginal effects are also computed on the conditional expectation  $E(y|y>0, \mathbf{x})$ . For details, see Greene (2003).

A major factor influencing the demand for food and real income transfer is the price subsidy under TPDS. TPDS price of a food commodity divided by its open market price at the village level reflects the subsidy—the lower the TPDS price relative to the market price, the larger is the subsidy per unit bought. Whether subsidies on food complements (e.g. rice and wheat in some parts of India) affect real income transfers is also examined.

As noted earlier, BPL households frequently buy amounts of foodgrains that are a small fraction of their entitlements. This may seem surprising given the food price subsidy. Two sets of reasons are given. One relates to the high transaction costs of buying from a FPS. These include long distances to FPS, and long waiting periods at these shops. These variables are used as described. Another set of reasons relates to inadequate supplies at FPS, mainly due to diversion to open markets where the margins are much higher. To capture the adequacy of supply, Kochar (2005) used number of APL households. Given the higher margins, the larger the number, the greater is the incentive for FPS to hold larger stocks. As the APL numbers are small in our sample, we have instead used proportion of BPL households in the village population on the assumption that lower margins on sales to BPL households are likely to be compensated by larger numbers. Another factor that could negatively impact supply is distance to the nearest town. The longer the distance, the greater is the likelihood of inadequate supply.

Above all, gains from major anti-poverty interventions such as NREG are sensitive to inequality in the distribution of endowments (typically, land) in rural areas. As greater inequality in land distribution is often associated with asymmetric power relations, a hypothesis verified here is whether real income gains under TPDS are lower in villages with greater inequality. A difficulty, however, is that any scalar measure of inequality in a distribution is an oversimplification.<sup>7</sup> The Gini coefficient of land distribution, for example, could be high where proportions of landless or near landless are high or it could also be high where those owning moderate and large amounts of land are high. So the results may vary with different forms of inequality as well.

### **III. TPDS in Andhra Pradesh, Maharashtra and Rajasthan**

Profiles of households participating in TPDS, transaction costs of buying from fair price shops, food price subsidies and real income gains, among other aspects, are reviewed below.

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<sup>7</sup> For an exposition, see Sen (1973)

### *Household Characteristics*

The shares of the Schedule Castes (SCs), Scheduled Tribes (STs) and other backward castes (OBCs) in the total population are nearly equal in Rajasthan, with the share of the OBCs being the highest (about 25 per cent for SCs, 30 per cent for STs and 34 per cent for OBCs). In Andhra Pradesh, the share of OBCs in the total population (under 49 per cent) is the highest, followed by SCs (about 29 per cent) and STs (under 10 per cent). In Maharashtra, the share of the OBCs in the total population is the highest among the three states (about 51 per cent), with considerably lower, though nearly equal, shares of the SCs (about 13 per cent) and STs (about 15 per cent).

The share of poor households in the total population is the highest in Rajasthan (about 41 per cent), with the highest share of acutely poor (about 30 per cent); Andhra Pradesh and Maharashtra stood second and third in terms of share of poor households in respective populations with nearly the same share (about 25 per cent), although the proportion of acutely poor is greater in Andhra Pradesh than in Maharashtra.

The land ownership distribution of households also varies significantly. Among the three states, Andhra Pradesh has the highest share of landless households (nearly 44 per cent). The share of the landless is nearly equal in Rajasthan and Maharashtra. Maharashtra has the highest percentages of households in the landowning category of more than 5 acres (about 16 per cent) whereas those of Andhra Pradesh and Rajasthan are almost equal (about 4 per cent). The share of small farmers<sup>8</sup> is the highest in Rajasthan (about 52 per cent), followed by Andhra Pradesh (about 41 per cent) and Maharashtra (about 21 per cent).

Education is an important indicator of human development. The education level of household head differs in these states. While the share of illiterate household heads is the highest (above 44 per cent) in Andhra Pradesh, Maharashtra has the least (under 28 per cent) and Rajasthan comes in between with 38 per cent of households with illiterate heads. Rajasthan has the highest (above 12 per cent) share of household heads with secondary and higher education levels, as compared to Maharashtra (under 9 per cent) and Andhra Pradesh (under 6 per cent).

The distribution of household size also differs in these states. While nearly 60 per cent of households in Andhra Pradesh have less than 5 members, the shares of this group in

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<sup>8</sup> Households with land-owned in the range 0 to 2 acres.

Maharashtra and Rajasthan are about 53 per cent and 38 per cent, respectively. Rajasthan has the highest share of large households (more than 8 members).

### *TPDS Participation*

The proportion of households participating in the TPDS is the highest in Andhra Pradesh (92%), followed by Maharashtra (78%) and then Rajasthan (58%). In Rajasthan, the share of STs is the highest (about 38 per cent) among the TPDS participants, followed by OBCs (about 30 per cent), and SCs (about 22 per cent); in Andhra Pradesh, the share of OBCs among all TPDS participant is the highest (nearly 48 per cent), followed by SCs (nearly 32 per cent) and STs (about 10 per cent); OBCs had the highest participation in Maharashtra with the highest share among the three states (nearly 47 per cent), STs come next, followed by SCs.

Among households participating in the TPDS in all three states, share of non-poor households is significantly higher than those of the poor, with the ratio of non-poor to poor participating households being 1.2 (for Rajasthan), 2.6 (for Maharashtra) and 2.7 (for Andhra Pradesh).

We next examine the share of landless among TPDS participants, Andhra Pradesh had the highest share (nearly 46 per cent), followed by Maharashtra (about 40 per cent) and Rajasthan (34 per cent). While the share of participants declines with increase in land owned in both Rajasthan and Andhra Pradesh, it increases after the initial decline in Maharashtra.

Among households that participated in the TPDS, the share of those with illiterate heads is nearly equal in Rajasthan and Andhra Pradesh (about 43–46 per cent) and it is lowest in Maharashtra (30 per cent). Further, while in Andhra Pradesh, the share of household participating in the TPDS falls with higher level of education of the household head, in Rajasthan this declines till secondary education and then rises at the highest education level. In Maharashtra, this first increases (up to primary levels) and then declines.

TPDS participation and household size reveal an interesting pattern. While in Andhra Pradesh and Maharashtra small households (with  $\leq 4$  members) exhibit highest share of TPDS participation, in Rajasthan relatively large households (5–8 members) do so.

**<Table 1 here>**

*Excess of Market Price over TPDS Price – Extent of Subsidy*

To assess the difference between subsidised food price and market price, we computed excess of market price over PDS price for wheat, rice, and sugar at the village level.<sup>9</sup> Our key observations, based on Table 1, are as follows:

In the case of wheat in Rajasthan, the excess of market price over TPDS price varies in the range of 50 per cent to 90 per cent, with the highest concentration of villages (about 57 per cent) in the range 60-70 per cent. In Andhra Pradesh, we do not have data available on wheat TPDS prices. In Maharashtra, the excess of market price over TPDS price varies in the range of 40 per cent to 90 per cent, with about 88 per cent of villages in the range 40–70 per cent.

We have sufficient data for all three states in the case of rice. The minimum range of excess of market price over TPDS price is 30–50 per cent in all the three states. While in Rajasthan and Maharashtra, very small concentrations of villages are found in the highest range of price differences of 80–90 per cent, and 70–80 per cent, respectively, in Andhra Pradesh, about 28 per cent of the villages are concentrated in the highest range (80–90 per cent). However, in all three states, the majority of the villages have excess of market price over TPDS price in the range of 50–70 per cent.

For sugar, data on TPDS price are available only for Rajasthan and Andhra Pradesh. In Rajasthan, nearly 69 per cent of villages have 20–30 per cent of excess of market price over TPDS price; in Andhra Pradesh, by contrast, the majority of villages (68 per cent) are concentrated in the excess range of 10–20 per cent.

*Participation in TPDS by Income Class*

To examine participation in TPDS by income class we study the cumulative distribution functions (CDF) of per capita monthly expenditure for participants and non-participants in the TPDS (Figs 1 to 4), using stochastic dominance tests. The advantage of these tests is that inferences about targeting of the TPDS can be drawn over a permissible range of poverty cut-off points and for the FGT class of poverty indices.<sup>10</sup> If, for example, the CDF of non-participants in TPDS lies below that of the participants over the permissible range of poverty

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<sup>9</sup> For kerosene, out of the villages for which we have data, 8 villages are in Rajasthan, 19 villages in Andhra Pradesh and 7 villages in Maharashtra. However, given the measure of participation in TPDS, no further comments are made.

<sup>10</sup> See, for example, Atkinson (1987)

cut-off points, the former displays first order stochastic dominance (FOD). In that case, TPDS is better targeted on the poor in terms of all FGT poverty indices.

**<Figures 1 to 4 here>**

As the CDF of non-participants lies below that of participants over the PCME range, Rs  $\geq$  585, it follows that the former FOD the latter.<sup>11</sup> This implies that TPDS participants are poorer in terms of the FGT class of indices.

- In the case of Andhra Pradesh, there is robust confirmation of TPDS targeting in terms of the FGT class of poverty indices.
- Maharashtra also exhibits FOD of the CDF of non-participants over the CDF of participants, implying that the TPDS participants were poorer than non-participants in terms of the FGT indices.
- Comparisons of TPDS targeting across Rajasthan, Andhra Pradesh and Maharashtra are, however, rendered difficult by the intersection of the CDFs of participants in Andhra Pradesh and Rajasthan within the permissible range, implying that FOD is ruled out. Given the overlap in the CDFs, what could be inferred is that targeting of the TPDS in these states is largely similar. However, as the CDF of participants for Maharashtra FOD the other CDFs, it follows that TPDS was worst targeted in this state.
- Over a wide range of per capita expenditures, both Andhra Pradesh and Rajasthan show FOD of the CDF of TPDS participants over that of the corresponding CDF for Maharashtra. So, in both Andhra Pradesh and Rajasthan, TPDS is better targeted than in Maharashtra.
- However, given that CDF of per capita expenditure of participating households of Andhra Pradesh crosses over that of Rajasthan at the lower limit of the poverty cut-off point and lies above it over the admissible poverty range, TPDS in Andhra Pradesh is better targeted than in Rajasthan.

#### *Transaction Costs of Buying from Fair Price Shops (FPS)*

We now examine some elements of the transactions costs associated with buying from fair price shops. Key elements of transactions costs are the distance travelled to FPS and the waiting time to buy from these shops.

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<sup>11</sup> The actual poverty cut-off point is Rs 450 (per capita per month).

We first look at the distance to nearest FPS in Table 2.

<Table 2 here>

The maximum range of distance of FPS from the household is highest for Rajasthan (0–12 km), followed by Andhra Pradesh and Maharashtra with an almost equal range of 0 to 3 km. The average distance between a household and the FPS is the highest for Rajasthan, followed by Andhra Pradesh and then Maharashtra. In Maharashtra, an overwhelming majority of the households (above 85 per cent) live within a range of 1 km from the FPS. The corresponding figures for Andhra Pradesh and Rajasthan are, respectively, 72 per cent and 36 per cent.

As the distance to the FPS rises, the proportions of households in total population within specified intervals fall. Maharashtra, however, is an exception, as the lowest proportion of households (under 2 per cent) live in the range of 1–2 km.

In Table 3, we examine the distribution of waiting times for households participating in TPDS.

<Table 3 here>

In Rajasthan, about 45 per cent of the participating households had to wait for more than 45 minutes to make purchases from FPS. By contrast, nearly 90 per cent of the TPDS participants in Andhra Pradesh and 96 per cent in Maharashtra had to wait 45 minutes or less at the FPS. In Rajasthan, the highest proportion of participating households was in the <60 minutes waiting time range (for BPL households), 15–30 minutes (APL households) and 45–60 minutes (Antyodaya households). In Andhra Pradesh and Maharashtra, for all three categories (BPL, APL, Antyodaya), the highest proportion of participating households was in the 15–30 minutes' waiting range.

The mean waiting time for a TPDS participating household at FPS is highest in Rajasthan (more than 64 minutes), followed by Andhra Pradesh (about 30 minutes) and Maharashtra (about 24 minutes). In Rajasthan, BPL card holders had the highest (mean) waiting time at the shop while APL card holders had the lowest. In Andhra Pradesh, APL card holders had the lowest mean waiting time, followed by BPL and Antyodaya card holders. In Maharashtra, BPL cardholders had the highest mean waiting time, followed by APL and Antyodaya cardholders.



Other elements of transaction costs include whether there is defrauding by short-weight of foodgrains and whether the quality supplied is inferior.

In Rajasthan, 20 per cent of the reporting households believe that fair price shops short weight foodgrains, whereas in Maharashtra, 14 per cent do so. In Andhra Pradesh, a large proportion of households (32 per cent) believe that FPSs short- weight grains.

As far as the quality perception is concerned, about 45 per cent of the households in Rajasthan, 33 per cent in Maharashtra and 70 per cent in Andhra Pradesh are satisfied with the quality of food grains.

#### *Share of Expenditure on Food Bought from TPDS*

As not just participation but, more importantly, entitlements under TPDS depend on whether a household has a BPL card, we examine how BPL cards are distributed first.

In Rajasthan, 30 per cent (6 per cent) of the households possessed a BPL card (Antyodaya card). The corresponding figure was 19 per cent (5 per cent) among the non-poor households, and 44 per cent (8 per cent) among the poor households. In Maharashtra, 52 per cent (4 per cent) of the households possessed a BPL card (Antyodaya card). The corresponding figure was 43 per cent (4 per cent) among the non-poor households, and 78 per cent (3.5 per cent) among the poor households. In Andhra Pradesh, 80 per cent (10 per cent) of the households possessed a BPL card (Antyodaya card). The corresponding figure was 79 per cent (9 per cent) among the non-poor households, and 82 per cent (14 per cent) among the poor households.

In Table 4 we give the distributions of the share of expenditure on food items bought from TPDS by participating households.

**<Table 4 here>**

In the case of wheat, 59 per cent of the participating households in Maharashtra bought 80 per cent of their wheat through FPS, and 34 per cent bought none. In Rajasthan, 20 per cent of the participating households bought more than 80 per cent of their wheat from FPS, and 48 per cent bought none. Mean share percentages of wheat are significantly higher in Maharashtra (62 per cent), as compared to Rajasthan (30 per cent). No information on wheat is available for Andhra Pradesh.

In the case of rice, 35 per cent of households in Rajasthan made  $\geq 80$  per cent of their purchases of rice through TPDS. The corresponding figures for Maharashtra and Andhra Pradesh were, respectively, 55 per cent and just 1.3 per cent. This suggests that households in Andhra Pradesh are more dependent on the market than on TPDS. About 60 per cent of households in Andhra Pradesh bought  $\leq 20$  per cent of their rice through TPDS. It is noteworthy that 63 per cent of the participating households in Rajasthan and 33 per cent in Maharashtra bought none of their rice from FPS. Mean share percentage of rice is the lowest in Andhra Pradesh (only 20 per cent). Maharashtra has the highest mean share (59 per cent), somewhat higher than Rajasthan (36 per cent).

In the case of sugar in Rajasthan, 22 per cent of the households bought  $\geq 80$  per cent of their sugar from FPS. The corresponding figure for Andhra Pradesh is about 41 per cent. 72 per cent of the participating households in Rajasthan and 33 per cent in Andhra Pradesh did not buy sugar from the TPDS. Mean share percentage of sugar is significantly higher in Andhra Pradesh (about 50 per cent), as compared to Rajasthan (about 26 per cent). No information on sugar is available for Maharashtra.

In Table 5, we report estimates of the income transferred through the TPDS in these states.

**<Tables 5a, 5b, 6 here>**

In Table 5a, we report on mean real income transferred (RIT), from sales of various food items (wheat, rice and sugar) through TPDS per participating household per month. In table 5b, we document mean RIT per participating household per month<sup>12</sup>.

Let us examine RIT from TPDS for wheat. The mean RIT among participating households is the highest in Rajasthan (Rs. 93) and lowest in Maharashtra (Rs. 60). Sufficient data are not available for Andhra Pradesh. In Rajasthan, RIT from TPDS for wheat to half of the participating households is Rs. 100 or less (in fact, about 48 per cent of the households have no real income transfer from TPDS), about 28 per cent have between Rs. 100 and Rs. 200, and 19 per cent have more than Rs. 200. By contrast, in Maharashtra, about 34 per cent of the households had no real income transfer, and about 20 per cent had real income transfers of greater than Rs. 100.

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<sup>12</sup> Note that in this section, ‘participating households’ are those households which consumed food such as wheat, rice or sugar from TPDS during 2007.

For wheat, it is interesting to note that mean RIT among the acutely poor households (Rs. 56) is lower than that among moderately poor (Rs. 121) and non-poor (Rs. 71 for moderately non-poor and Rs. 128 for the relatively affluent) in Rajasthan; and in Maharashtra, the RIT among the acutely poor (Rs. 65) is slightly higher than those among other categories (Rs. 55 to Rs. 63). Mean RITs per participating household from wheat consumption from TPDS in Rajasthan and Maharashtra are Rs. 187 and Rs. 97, respectively.

Turning to RIT from TPDS rice consumption, we observe that mean RIT for participating households is the highest in Andhra Pradesh (Rs. 142), followed by Maharashtra (Rs. 54) and then Rajasthan (Rs. 25). Going by the distribution of participating households across ranges of RIT from TPDS for rice, we observe that, in Rajasthan, about 63 per cent of the participating households have no RIT, and about 32 per cent have mean RIT of Rs. 100 or less. In Andhra Pradesh, about 80 per cent participating households got mean RIT of more than Rs. 100. In Maharashtra, only 16 per cent households obtained mean RIT of more than Rs. 100 from rice consumption from TPDS; 33 per cent obtained no real income transfer and 50 per cent had real income transfers less than Rs. 100.

Going by mean RIT across households of different poverty status, we observe that in Rajasthan, mean RIT for acutely poor households is the lowest (Rs. 14). In Andhra Pradesh, mean RIT is higher among the poor (Rs. 167) than among the non-poor (Rs. 125 to Rs. 145). The opposite is true in Maharashtra, where the most affluent households have the highest mean RIT for rice (Rs. 65 for the most affluent and Rs. 41–48 for the poor). Mean RITs per participating household from rice consumption from TPDS in Andhra Pradesh is highest (Rs. 147), followed by Maharashtra (Rs. 95) and then Rajasthan (Rs. 56).

In the case of sugar, we have data available only for Rajasthan and Andhra Pradesh. Mean RITs among participating households from sugar under TPDS in Rajasthan and Andhra Pradesh are Rs. 4 and Rs. 2, respectively. There is no clear pattern in mean RIT across participating households of different poverty status. Mean RITs per participating household from sugar consumption under TPDS in Rajasthan is highest (Rs. 13) and lowest in Andhra Pradesh (Rs. 4).

#### **IV. Results on Tobit Estimation**

The results of the Tobit estimation are given Tables 7a-7g.

<Tables 7a-7g here>

*(a) Andhra Pradesh*

Let us first consider the association between economic status and real income transferred through subsidised rice, as reflected in the coefficients of land owned and its square (recall that landownership results in exclusion from BPL classification). The coefficient of land-owned is negative and significant while that of land-owned squared is not significant. So the poorer a household, the greater was the real income gained. The effect of the land Gini is negative, implying that in villages with higher inequality in land distribution the benefits were restricted. Following our literature survey, this could imply greater diversion of rice to open markets from such villages. The lower the ratio of PDS to market price of rice, the greater was the real income gain (either because the quantity bought was higher or the same quantity bought translated into higher income gain because of a higher price subsidy). Distance to FPS shops, however, did not influence real income gain as they were well dispersed. Household size, as expected, had a significant positive effect through higher rice demand but the effect weakened among larger households. But the overall positive effect on real income is substantial. As emphasised earlier, with the shift to TPDS and extremely low margins on sales to BPL households, FPS have a weak incentive to maintain adequate stocks, or when the stocks are adequate, large supplies are diverted to the open market at much higher margins. Our data do not allow us to capture supply shortages or diversions to open markets (within or outside the village). A proxy variable — distance to the nearest town — is used on the premise that the longer the distance, the greater the probability that shortages will persist longer. Our results confirm this. The coefficient of distance to nearest town is negative and that of its square is positive. But altogether the effect is negative implying that real incomes are more constrained in villages in far flung areas.

The overall specification is validated by the likelihood ratio test.

The real income transfer through subsidised sugar is positively linked to land-owned — while the coefficient of land-owned is positive and weakly significant, that of its square is negative and significant. The effect, however, is small. The effect of the land Gini is not significant. The ratio of PDS to market price is negative and significant, suggesting that real income transfers are larger when the price subsidy is larger. As may be noted from the column of marginal effects, the price subsidy is key to real income transfer. Distance to FPS, however, has no effect for the reason stated earlier. Household size, as expected, has a very large effect through higher demand for sugar despite a weakening effect of larger households. As

explained earlier, the longer the distance to a nearest town, the more supply constrained are the FPS and the lower are the real income gains.

The overall specification is validated by the likelihood ratio test.

*(b) Rajasthan*

Let us first consider the results on real income transfer through subsidised wheat.

The effect of land-owned — including that of its square—has a large positive effect on real income transfers, implying leakages to the better endowed on a very large scale. But there is a positive effect of the land Gini, implying that in villages with greater concentration of land distribution, real income gains were larger. As conjectured earlier and subject to verification, if there is a large number of landless and near landless, manifesting in a higher Gini, their real income gains may be higher. This does not contradict the previous result which focuses on the positive effect of land ownership of individual households. Although fewer in number, such households may benefit more than the landless but, between villages, the higher proportion of landless in one may tilt real income gains in its favour. The lower the ratio of PDS to market price of wheat, the larger are the real incomes. We considered the possibility of subsidised rice and wheat being substitutes or complements but our results are inconclusive. Distance to FPS has a negative effect. This is not surprising as FPS are not so well dispersed as in Andhra Pradesh. Nor does the agricultural wage rate at the village level have a significant effect. The hypothesised effect is positive as higher wage rates could result in higher demand for wheat. Somewhat surprisingly, none of the demographic variables has a significant effect. In order to capture the effect of supply shortages, we experimented with proportion of BPL cardholders in village population. The presumption is that low margins could be offset by larger numbers of BPL cardholders.<sup>13</sup> This has the hypothesised positive effect on real incomes.

The likelihood ratio test validates the overall specification.

The results on subsidised rice are as follows. The effect of land-owned is positive on real income transferred while that of its square is not significant. The land Gini does not influence real incomes. As in the case of wheat, we have considered both subsidised wheat and rice prices and their squared values. The combined effect of rice price subsidy (including its

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<sup>13</sup> Recall that Kochar (2005) relies on the number of APL households. We did not use this as the numbers of APL households in our samples were small.

square) is negative, implying that the greater the rice price subsidy, the lower was the real income gain. This is not plausible. However, the combined effect of subsidised wheat price (including its squared value) is positive, implying that the higher the PDS wheat price ratio, the larger the demand for subsidised rice and consequently the higher real income transfer through subsidised rice. Distance has a weakly significant negative effect. None of the demographic variables has a significant effect on rice demand and thus no real income effect. Controlling for all these effects, the higher the agricultural wage, the greater was the real income transferred. As in the case of wheat, the higher the proportion of BPL cardholders, the greater are the real incomes transferred through rice, implying, as argued earlier, more adequate supplies.

The overall specification is validated by the likelihood ratio test.

The results on real incomes through subsidised sugar are somewhat uneven. Land owned is associated with a positive effect on income transfers while that of its square is not significant. The land Gini has a large favourable effect on real income transfers presumably because of the nature of inequality in land distribution, as surmised earlier. The combined effect of ratio of PDS to market price and its square is negative and moderately large (in its absolute value). This implies that the larger the subsidy, the greater is the income gain or vice versa. None of the demographic variables has a significant effect. Nor does agricultural wage rate at the village level have any effect. However, as a proxy for adequacy of supply, proportion of BPL cardholders in a village population has a large positive effect on real incomes.

The overall specification is validated by the likelihood ratio test.

*(c) Maharashtra*

In the case of wheat, while land owned does not have a significant effect, its square has a significant positive effect. But the effect of the land Gini is negative and large (in absolute value), pointing to larger leakages to open markets. The ratio of PDS to market price has a significant negative effect and the (absolute) value is large, implying that the larger the price subsidy, the greater was the income transferred. But the longer the distance to FPS, the lower was the real income gain.<sup>14</sup> The combined effect of household size and its square is positive. As argued earlier, on the assumption that the proportion of BPL cardholders is a proxy for supply adequacy, its effect on real income is positive and large.

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<sup>14</sup> Note that, while the mean distance to FPS is lowest in Maharashtra, its standard deviation is higher than in Andhra Pradesh.

The overall specification is validated by the likelihood ratio test.

There is no association between land-owned (or its square) and real income transferred through subsidised rice. Somewhat surprisingly, the effect of the land Gini is reversed, compared with the effect on real income through wheat. Instead of larger leakages, real incomes through rice are substantially larger. Depending on whether the numbers of better endowed in terms of land are *instrumental* in not just larger leakages but also more adequate supplies, this reversal of the wheat effect is not unlikely. Both ratios of PDS to market price of wheat and rice (and their squares) have significant negative effects on real incomes through subsidised rice. The (absolute) values of these effects are large. The larger the rice price subsidy, the greater is the income gain. A similar effect for wheat suggests complementarity between rice and wheat demand. As expected, household size has a significant positive effect on real income. As a proxy for adequacy of supply, the proportion of BPL cardholders has a large positive effect on real income transfers.

The overall specification is validated by the likelihood ratio test.

In sum, our analysis points to several factors determining real income transfers through subsidised wheat, rice and sugar and variation in these transfers across the three states. Land as a proximate indicator of economic status has mixed effects varying by commodity and state. Specifically, there are a few cases where land-owned and real-income transfers are lower (rice in Andhra Pradesh, and wheat and rice in Maharashtra), suggesting that those not so well endowed (and by implication BPL households) benefited more. Inequality in land distribution takes different forms (concentrations of landless and near landless or of the well-endowed) and influences real incomes in complex ways (leakages and larger supply or just leakages). As a result, the effects vary by commodity and state (negative for rice in Andhra Pradesh, positive for wheat in Rajasthan, and rice in Maharashtra). The extent of price subsidy, in most cases, results in larger real income transfers. Household size influences positively demand and real incomes in some cases (rice and sugar in Andhra Pradesh, and wheat in Maharashtra) and negatively in other cases (wheat and rice in Rajasthan), depending on whether economies of scale in food expenditure matter more. There is some evidence of transaction cost (e.g. distance to FPS) limiting income gains (wheat in Rajasthan and Maharashtra). There is overwhelming support for supply inadequacy limiting income gains, given proximate indicators.

## V. Conclusions

An important aspect of the assessment of the usefulness of any social welfare programme, particularly one that claims to be targeted towards the poor, is the examination of its incidence at the household level. This helps us understand directly whether the programme's benefits are reaching those for whom it was intended. In addition, it becomes important to understand the factors determining household benefits from the programme. Such an analysis is particularly relevant for a social welfare programme such as the TPDS, given that the cost associated with it is spiraling uncontrollably.

This paper has used primary data from a representative sample of rural households collected from three Indian states, Rajasthan, Andhra Pradesh and Maharashtra to understand various access issues related to the TPDS. It documents the fact that the programme is not well targeted in some instances, that both the poor and non-poor get subsidized by the PDS and that the distribution of benefits by caste, waiting time for buying food through fair price shops and land ownership categories are not what was intended. The paper also models the determinants of real income transfers from wheat, rice and sugar under TPDS as a function of a household's economic status, its demographic characteristics, price subsidy (at the village level), transaction costs of buying from FPS, and supply constraints.

Our analysis corroborates the influence of these factors. Land as a proximate indicator of economic status has mixed effects varying by commodity and state. Specifically, there are a few cases where land owned and real income transfers are lower (rice in Andhra Pradesh, and wheat and rice in Maharashtra), suggesting that those not so well endowed (and by implication BPL households) benefited more. Inequality in land distribution takes different forms (concentrations of landless and near landless or of the well-endowed) and influences real incomes in complex ways (leakages and larger supply or just leakages). As a result, the effects vary by commodity and state (negative for rice in Andhra Pradesh, positive for wheat in Rajasthan, and rice in Maharashtra). The extent of price subsidy, in most cases, results in larger real income transfers. Household size influences positively demand and real incomes in some cases (rice and sugar in Andhra Pradesh, and wheat in Maharashtra) and negatively in other cases (wheat and rice in Rajasthan), depending on whether economies of scale in food expenditure matter more. There is some evidence of transaction cost (e.g. distance to FPS) limiting income gains (wheat in Rajasthan and Maharashtra). There is overwhelming support for supply inadequacy limiting income gains, given proximate indicators.



In the context of dismal performance of the TPDS and desperation of the UPA government, the National Advisory Council (NAC) has enthusiastically endorsed a universal food subsidy under the aegis of a National Food Security Act (NFSA).<sup>15</sup> In our view, this (as well as another extreme proposal to replace TPDS with a cash transfer system based on the biometric identity and multi-purpose smart cards<sup>16</sup>) are *escapist*, as we believe that there is considerable scope for reform of the TPDS and for better targeting of the poor with the existing outlay. Let us first examine why a universal food subsidy is unlikely to improve the public distribution of food.

Our comments are anchored to a recent emphatic endorsement of the NAC proposal by Himanshu and Sen (2011). As elaborated below, their endorsement is contentious.

First, they insist that a universal PDS is the only option consistent with RTF and, more contentiously, that feasible alternatives that are more universal and less targeted are more likely to be effective in benefiting the poor.<sup>17</sup> Second, between 1993–94 (a universal PDS) and 2004–05 (TPDS), the leakages grew enormously—that of rice from 19 per cent to 40 per cent; and that of wheat from 41 per cent to 73 per cent. Per capita per month consumption of PDS rice and wheat remained unchanged (about 1 kg) although PDS off-take doubled and subsidy rose even more. There was, however, a slight improvement in access by the poorest 50 per cent of the population — from 28 per cent to 30 per cent. But this must be judged a colossal failure, given the massive cost of leakages. As noted earlier, the cost of transferring Rs 1 to the poor is Rs 8.5. A considerable chunk of budgeted food subsidies (81 per cent in 2008–09) goes to the Food Corporation of India (FCI) to cover its expenses for procurement, transportation, distribution and for carrying over huge stocks. The high costs reflect inclusion errors, as well as corruption and leakages of grains at all stages in the supply chain, from the procurement of grains by FCI to the final sales to eligible households (Svedberg, 2010). Third, Himanshu and Sen (2011) are emphatic that the more universal the food subsidy— as in Tamil Nadu, among a few other states—the lower would be the leakage. There are two issues that are conflated in this proposition: one is the huge diversion of PDS foodgrains to the market, and the second is the losses during storage in open godowns. Whether a universal

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<sup>15</sup> For a detailed comment, see Gaiha et al. (2011).

<sup>16</sup> It is far from evident how the economic status of a household will be determined through a biometric identification without accurate assessment of household assets. Land records, for example, continue to be fudged on a large scale and incomes are hard to define and measure among the self-employed in agriculture in rural areas.

<sup>17</sup> This is mistaken as a right to food could be interpreted as a right to a right, or, more specifically, as a right to sensible livelihood expansion and food price stabilisation policies. For details, see Gaiha (2003).

subsidy would reduce leakages to the market has little to do with how universal the food subsidy is and more to do with the wedge between the market price and PDS price. If procurements are higher, market price is likely to rise relative to the PDS price, and the market diversions would be larger. An earlier analysis by one of us corroborates this.<sup>18</sup> As far as wastage is concerned, with larger procurements and given storage facilities, wastage is also likely to be larger under a universal scheme. Fourth, a fraction of entitlements is bought by BPL households thus limiting real income subsidy to them. 30 per cent of total TPDS purchases of subsidised foodgrains (rice and wheat) are made by poor households with AAY or BPL ration cards<sup>19</sup>. Almost two-thirds of the poor (62.4 per cent), however, do not possess these cards, limiting their purchases to miniscule amounts. Add to this difficulty high transaction costs (long distances to FPS and waiting periods) and perceptions of poor quality and under-weighing, to get a clearer picture of why the poor on average tend to buy amounts considerably lower than their entitlements (barely 15 kg of rice and wheat when the entitlements is 35 kg). As a result, the income transfer per person among BPL households is slightly below Rs 4 in both rural and urban areas (Svedberg, 2010).

If our analysis has any validity, careful attention must be given reducing transaction costs — long distances to be travelled, long queues and waiting periods, and under-weighing by FPS. A better network of fair price shops, higher margins and adequate supplies would go a long way in making the TPDS more cost-effective. A real culprit is the FCI with its abysmal inefficiency in procuring, storing and distributing food. Above all, top priorities include livelihood expansion opportunities in rural areas, and food price stabilisation—two areas in which UPS's track record has and continues to be unimpressive.

So, even with existing budget outlays, there is considerable scope for better targeting the poor.<sup>20</sup>

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<sup>18</sup> See Gaiha et al. (2007).

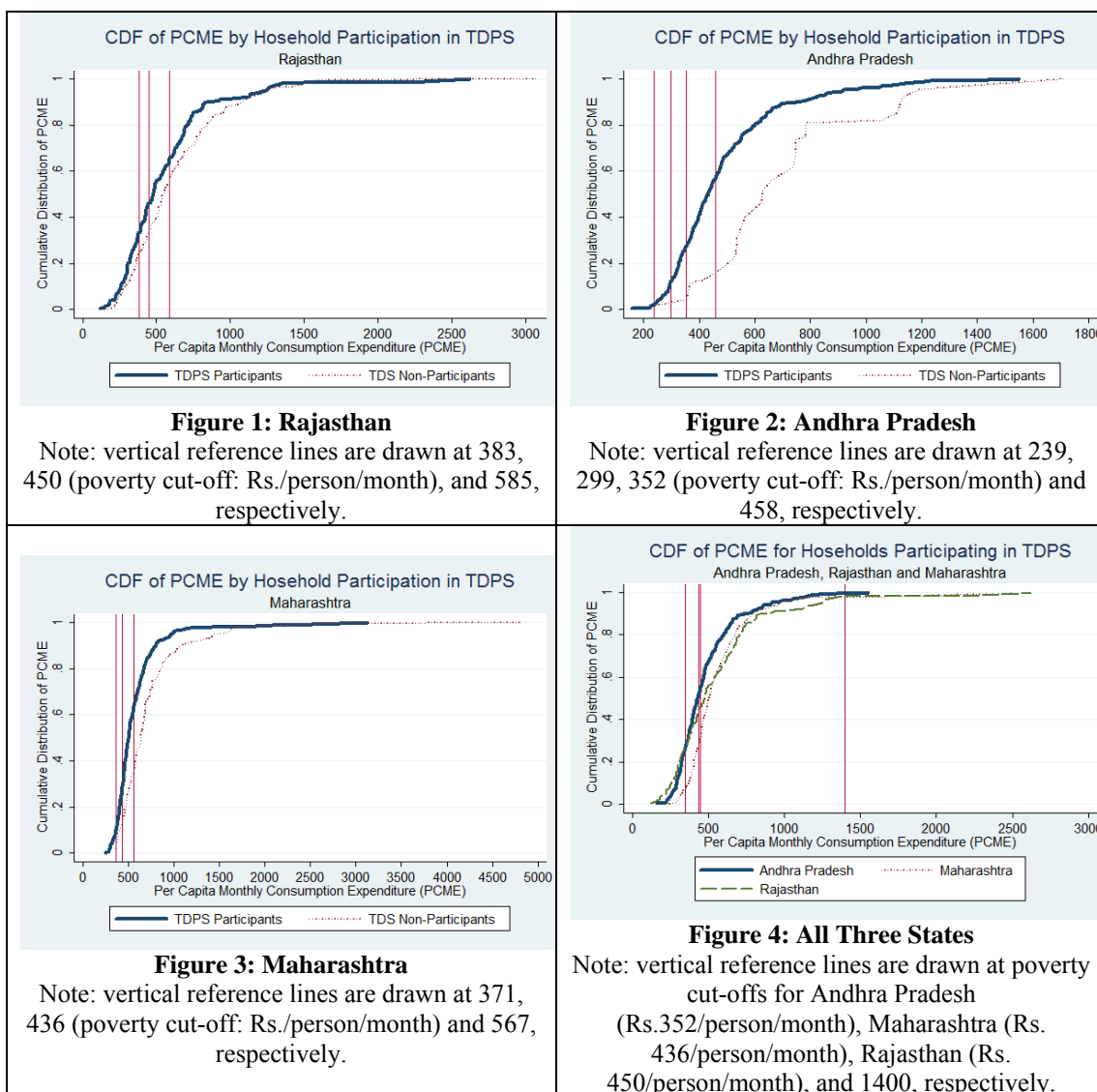
<sup>19</sup> Under the AAY scheme, the poorest of the poor are given the option to buy food at even more subsidised prices than BPL households. Note that some of these estimates differ from those reported by Svedberg (2010).

<sup>20</sup> The case for cash transfers as an alternative to a universal food subsidy is not persuasive, as it does not confront the difficulties of identifying the poor and risks of collusion among functionaries at different levels. A case in point is Svedberg (2010).

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**Figures 1–4: Cumulative Distribution Functions of Per Capita Monthly Consumption Expenditure for TDPS Participating and Non-Participating Households**



**Table 1: Distribution of excess of market price over PDS price for Wheat, Rice, and Sugar Commodities**

Ranges of excess of market price over PDS price	% of villages corresponding to commodity		
	Wheat	Rice	Sugar
<b>Rajasthan</b>			
0-10%	0.00	0.00	0.00
10-20%	0.00	0.00	6.25
20-30%	0.00	0.00	68.75
30-40%	0.00	5.26	18.75
40-50%	0.00	15.79	6.25
50-60%	21.74	31.58	0.00
60-70%	56.52	26.32	0.00
70-80%	13.04	15.79	0.00
80-90%	8.70	5.26	0.00
90-100%	0.00	0.00	0.00
Total number of villages for which information is available	23	19	16
<b>Andhra Pradesh</b>			
0-10%	*	0.00	8.00
10-20%		0.00	68.00
20-30%		0.00	16.00
30-40%		0.00	8.00
40-50%		4.00	0.00
50-60%		28.00	0.00
60-70%		36.00	0.00
70-80%		4.00	0.00
80-90%		28.00	0.00
90-100%		0.00	0.00
Total number of villages for which information is available	1	25	25
<b>Maharashtra</b>			
0-10%	0.00	0.00	**
10-20%	0.00	0.00	
20-30%	0.00	0.00	
30-40%	0.00	8.00	
40-50%	12.00	20.00	
50-60%	44.00	32.00	
60-70%	32.00	28.00	
70-80%	8.00	12.00	
80-90%	4.00	0.00	
90-100%	0.00	0.00	
Total number of villages for which information is available	25	25	0

\* Data are available only for one village. \*\* Data are not available for any village

**Table 2: Distribution of distance from PDS participating households to Fair Price Shop**

(a) PDS participating households to Fair Price Shop (km)	% of PDS participant households in		
	Rajasthan	Andhra Pradesh	Maharashtra
0-1 km	35.60	71.99	84.24
1-2 km	27.93	18.32	02.12
2-3 km	13.51	7.81	07.55
3 km and above	22.95	1.88	06.10
<b>All</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>
(b) Distance from household to Fair Price Shop (km): Key Statistics	Rajasthan	Andhra Pradesh	Maharashtra
Mean	1.58	0.64	0.39
Median	1.00	0.50	0.00
Standard deviation	1.64	0.62	0.89
Min	0.00	0.00	0.00
Max	12.00	3.00	3.00

**Table 3: Distribution of waiting times for PDS participating households by ration card type**

Ranges of waiting times at the fair price shop (in minutes)	% of PDS participant households by households are allotted				All
	BPL	APL	Antyodaya	Others	
<b>Rajasthan</b>					
≥0- ≤15	50.49(17.60)	40.99(24.91)	08.52(14.72)	0.00	19.63
>15- ≤30	40.90(22.28)	49.92(47.40)	09.18(24.80)	0.00	30.68
>30- ≤45	60.71(05.54)	16.33(02.60)	22.96(10.38)	0.00	05.14
>45- ≤60	49.92(15.12)	28.58(15.09)	21.50(32.29)	0.00	17.06
>60	80.88(39.46)	11.76(10.00)	07.36(17.81)	0.00	27.48
<b>All</b>	<b>56.33(100.00)</b>	<b>32.31(100.00)</b>	<b>11.36(100.00)</b>	<b>0.00</b>	<b>100.00</b>
<b>Andhra Pradesh</b>					
≥0- ≤15	74.57(11.60)	03.39(25.82)	22.04(26.85)	0.00(0.00)	13.48
>15- ≤30	88.22(71.64)	01.87(74.18)	09.19(58.43)	0.72(100.00)	70.37
>30- ≤45	91.55(06.88)	0.00(0.00)	08.45(04.97)	0.00(0.00)	06.51
>45- ≤60	98.67(09.42)	0.00(0.00)	01.33(01.00)	0.00(0.00)	08.28
>60	28.91(0.45)	0.00(0.00)	71.09(08.75)	0.00(0.00)	01.36
<b>All</b>	<b>86.65(100.00)</b>	<b>1.77(100.00)</b>	<b>11.07(100.00)</b>	<b>0.51(100.00)</b>	<b>100.00</b>
<b>Maharashtra</b>					
≥0- ≤15	58.75(31.42)	32.31(41.81)	08.94(61.60)	0.00	35.87
>15- ≤30	67.56(44.67)	28.28(45.26)	04.16(35.47)	0.00	44.35
>30- ≤45	79.66(20.84)	19.47(12.33)	0.87(02.92)	0.00	17.55
>45- ≤60	91.97(02.83)	08.03(0.60)	0.00(0.00)	0.00	02.06
>60	100.00(0.25)	0.00(0.00)	0.00(0.00)	0.00	0.17
<b>All</b>	<b>67.08(100.00)</b>	<b>27.72(100.00)</b>	<b>05.20(100.00)</b>	<b>0.00</b>	<b>100.00</b>

Note: Figures in parenthesis are the column percentages.

**Table 4: Distribution of share (%) of expenditure on food items brought from PDS among PDS participating households**

Share (%)	Rajasthan		Andhra Pradesh		Maharashtra	
	Mean (%)	% PDS participating households	Mean (%)	% PDS participating households	Mean (%)	% PDS participating households
Share of wheat expenditure brought from PDS						
0	0.00	47.50	NA	NA	0.00	34.02
>0-≤20	16.00	9.50			16.17	0.97
>20-≤40	30.22	17.66			33.36	3.32
>40-≤60	51.98	4.42			58.44	1.76
>60-≤80	63.75	1.32			70.06	1.24
>80-≤100	100.00	19.61			100.00	58.69
<b>All</b>	<b>29.60</b>	<b>100.00</b>			<b>61.85</b>	<b>100.00</b>
Share of rice expenditure brought from PDS						
0	0.00	63.03	0.00	3.21	0.00	32.72
>0-≤20	14.29	0.94	11.99	57.96	14.57	1.09
>20-≤40	0.00	0.00	27.33	30.96	32.37	7.43
>40-≤60	47.73	0.75	45.56	5.68	47.67	3.29
>60-≤80	72.92	0.38	62.65	0.85	60.47	0.38
>80-≤100	100.00	34.89	100.00	1.34	100.00	55.09
<b>All</b>	<b>35.66</b>	<b>100.00</b>	<b>19.87</b>	<b>100.00</b>	<b>59.45</b>	<b>100.00</b>
Share of sugar expenditure brought from PDS						
0	0.00	71.77	0.00	32.52	NA	NA
>0-≤20	12.07	0.16	17.03	1.30		
>20-≤40	30.51	0.36	26.43	10.91		
>40-≤60	55.03	1.80	45.10	14.29		
>60-≤80	67.64	3.99	63.64	0.15		
>80-≤100	100.00	21.93	100.00	40.84		
<b>All</b>	<b>25.74</b>	<b>100.00</b>	<b>50.48</b>	<b>100.00</b>		

**Table 5a: Distribution of Real Income Transferred (RIT) from TPDS among Participating Households**

Ranges of RIT from TPDS (Rs.) for different commodities	Rajasthan		Andhra Pradesh		Maharashtra	
	Mean	% of households	Mean	% of households	Mean	% of households
<b>Wheat</b>						
0	0.00	47.50	NA		0.00	34.02
>0-≤50	-	0.00			36.85	15.89
>50-≤100	66.12	5.10			74.33	27.85
>100-≤150	127.41	20.85			124.69	11.96
>150-≤200	177.01	7.61			161.21	6.55
>200	263.33	18.94			221.96	3.72
<b>All</b>	<b>93.28</b>	<b>100.00</b>			<b>60.30</b>	<b>100.00</b>
<b>Rice</b>						
0	0.00	63.03	0.00	3.21	0.00	32.72
>0-≤50	30.28	13.42	39.32	2.49	34.18	29.65
>50-≤100	69.65	18.89	77.34	18.47	68.39	21.33
>100-≤150	124.19	3.08	123.83	31.37	137.29	7.28
>150-≤200	181.57	0.77	162.14	27.01	181.20	3.70
>200	285.32	0.81	253.57	17.46	238.95	5.32
<b>All</b>	<b>24.75</b>	<b>100.00</b>	<b>142.17</b>	<b>100.00</b>	<b>54.12</b>	<b>100.00</b>
<b>Sugar</b>						
0	0.00	71.77	0.00	32.52	NA	
>0-≤50	12.78	28.23	3.50	67.48		
>50-≤100	-	0.00	-	0.00		
>100-≤150	-	0.00	-	0.00		
>150-≤200	-	0.00	-	0.00		
>200	-	0.00	-	0.00		
<b>All</b>	<b>3.61</b>	<b>100.00</b>	<b>2.36</b>	<b>100.00</b>		

**Table 5b: Mean Real income transferred (RIT) from TPDS (Rs.) per Participating Households per Village**

Commodity	Rajasthan	Andhra Pradesh	Maharashtra
Wheat	187.48	NA	96.99
Rice	56.22	147.15	94.80
Sugar	12.87	3.69	NA

DNA: Data not available. While computing mean RIT, a household is counted as one even if that consumes both wheat and rice from TPDS.



**Table 6: Definition of different levels of Poverty**

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 $\geq 383$ but < Rs.450	If per capita monthly consumption expenditure $\geq$ Rs.299 but<Rs.352	If per capita monthly consumption expenditure $\geq$ Rs.371 but<Rs.436
Moderate Non-poverty	If per capita monthly consumption expenditure $\geq$ Rs.450 but < Rs.585	If per capita monthly consumption expenditure $\geq$ Rs.352 but < Rs.458	If per capita monthly consumption expenditure $\geq$ Rs. 436 but <Rs.567
Affluent	If per capita monthly consumption expenditure $\geq$ Rs.585	If per capita monthly consumption expenditure $\geq$ Rs.458	If per capita monthly consumption expenditure $\geq$ Rs.567

**Table 7a: Results of Tobit Estimation (Andhra Pradesh – Sugar)**

No. of Observations =	470			
LR-chi2(10)=	116.64	Prob > Chi-2 =	0.000	
Log Likelihood=	-982.18	Pseudo R2 =	0.056	
Andhra Pradesh - SUGAR				
	Coefficient			Marginal Effect
Land Owned	0.529	(1.48)	-	0.249
Square of Land Owned	-0.222	(-2.36)	**	-0.104
Land Gini	2.202	(1.26)	-	1.034
Ratio of PDS to Market Price (Sugar)	-20.853	(-9.32)	***	-9.794
Distance to FPS	0.196	(0.71)	-	0.092
HH Size	0.230	(0.53)	-	0.108
HH Size - Squared	-0.011	(-0.25)	-	-0.005
No. of Adult Males	-0.143	(-0.61)	-	-0.067
No. of Adult Females	0.270	(1.09)	-	0.127
Distance to Nearest Town	-0.040	(-2.32)	**	-0.019
Constant	17.401	(7.45)		
<i>Sigma</i>	3.307			
<i>Left Censored Observations</i>	160			
<i>Uncensored Observations</i>	310			

**Table 7b: Results of Tobit Estimation (Andhra Pradesh – Rice)**

No. of Observations =	470			
LR-chi2(11)=	205.54	Prob > Chi-2 =	0.000	
Log Likelihood=	-2543.32	Pseudo R2 =	0.039	
Andhra Pradesh - RICE				
	Coefficient			Marginal Effect
Land Owned	-13.971	(-3.59)	***	-13.146
Square of Land Owned	0.643	(1.3)	-	0.605
Land Gini	-66.077	(-2.2)	**	-62.178
Ratio of PDS to Market Price (Rice)	-201.705	(-7.39)	***	-189.804
Distance to FPS	-5.172	(-1.03)	-	-4.867
HH Size	43.947	(6.1)	***	41.354
HH Size - Squared	-2.767	(-3.75)	***	-2.604
No. of Adult Males	2.842	(0.71)	-	2.674
No. of Adult Females	1.514	(0.36)	-	1.425
Distance to Nearest Town	-3.632	(-4.25)	***	-3.418
Distance to Nearest Town - Squared	0.087	(5.59)	***	0.082
Constant	147.393	(4.62)		
<i>Sigma</i>	58.723			
<i>Left Censored Observations</i>	22			
<i>Uncensored Observations</i>	448			

**Table 7c: Results of Tobit Estimation (Rajasthan - Wheat)**

No. of Observations =	360			
LR-chi2(12)=	58.32	Prob > Chi-2 =	0.000	
Log Likelihood=	-926.46	Pseudo R2 =	0.031	
<b>Rajasthan - WHEAT</b>				
	<b>Coefficient</b>			<b>Marginal Effect</b>
Land Owned	67.007	(2.72)	***	19.640
Square of Land Owned	-6.380	(-2.03)	**	-1.870
Land Gini	334.294	(1.94)	*	97.982
Proportion of BPL card holders in a Village	726.659	(3.76)	***	212.984
Ratio of PDS to Market Price (Wheat)	-617.255	(-2.01)	**	-180.918
Ratio of PDS to Market Price (Rice)	249.268	(1.22)	-	73.061
Distance to FPS	-19.989	(-2.04)	**	-5.859
HH Size	-14.817	(-0.57)	-	-4.343
HH Size - Squared	0.846	(0.41)	-	0.248
No. of Adult Males	-19.217	(-0.96)	-	-5.632
No. of Adult Females	-12.782	(-0.58)	-	-3.746
Agricultural Wage Rate	3.374	(1.35)	-	0.989
Constant	-487.819	(-2.8)		
<i>Sigma</i>	218.881			
<i>Left Censored Observations</i>	245			
<i>Uncensored Observations</i>	115			

**Table 7d: Results of Tobit Estimation (Rajasthan - Rice)**

No. of Observations =	360			
LR-chi2(14)=	75.29	Prob > Chi-2 =	0.000	
Log Likelihood=	-617.84	Pseudo R2 =	0.057	
<b>Rajasthan - RICE</b>				
	<b>Coefficient</b>			<b>Marginal Effect</b>
Land Owned	21.654	(1.7)	*	5.248
Square of Land Owned	-1.364	(-0.9)	-	-0.330
Land Gini	102.801	(1.11)	-	24.913
Proportion of BPL card holders in a Village	341.053	(2.97)	***	82.650
Ratio of PDS to Market Price (Wheat)	-2,428.399	(-2.65)	***	-588.495
Price Ratio (Wheat) - Squared	3,706.375	(2.52)	**	898.198
Ratio of PDS to Market Price (Rice)	-759.773	(-1.53)	-	-184.123
Price Ratio (Rice) Squared	950.030	(1.74)	*	230.229
Distance to FPS	-7.294	(-1.41)	-	-1.768
HH Size	-15.957	(-1.21)	-	-3.867
HH Size - Squared	1.119	(1.07)	-	0.271
No. of Adult Males	-13.105	(-1.19)	-	-3.176
No. of Adult Females	-16.545	(-1.4)	-	-4.009
Agricultural Wage Rate	2.742	(1.97)	**	0.665
Constant	192.815	(1.01)		
<i>Sigma</i>	105.363			
<i>Left Censored Observations</i>	278			
<i>Uncensored Observations</i>	82			

**Table 7e: Results of Tobit Estimation (Rajasthan – Sugar)**

No. of Observations =	290			
LR-chi2(13)=	29.03	Prob > Chi-2 =	0.007	
Log Likelihood=	-385.36	Pseudo R2 =	0.036	
<b>Rajasthan - SUGAR</b>				
	<b>Coefficient</b>			<b>Marginal Effect</b>
Land Owned	5.665	(1.94)	*	1.309
Square of Land Owned	-0.615	(-1.41)	-	-0.142
Land Gini	30.690	(1.96)	*	7.091
Proportion of BPL card holders in a Village	40.124	(3.28)	***	9.271
Ratio of PDS to Market Price (Sugar)	1,637.424	(2.2)	**	378.332
Price ratio (Sugar) - Squared	-1,128.157	(-2.15)	**	-260.665
Distance to FPS	-1.002	(-1.06)	-	-0.231
HH Size	-0.904	(-0.29)	-	-0.209
HH Size - Squared	0.015	(0.06)	-	0.003
No. of Adult Males	-0.558	(-0.27)	-	-0.129
No. of Adult Females	-1.462	(-0.58)	-	-0.338
Agricultural Wage Rate	0.063	(0.25)	-	0.015
Waiting time at FPS	0.005	(0.23)	-	0.001
Constant	-632.633	(-2.39)		
<i>Sigma</i>	17.459			
<i>Left Censored Observations</i>	225			
<i>Uncensored Observations</i>	65			

**Table 7f: Results of Tobit Estimation (Maharashtra - Wheat)**

No. of Observations =	483			
LR-chi2(12)=	51.13	Prob > Chi-2 =	0.000	
Log Likelihood=	-1693.08	Pseudo R2 =	0.015	
<b>Maharashtra - WHEAT</b>				
	<b>Coefficient</b>			<b>Marginal Effect</b>
Land Owned	-2.442	(-1.03)	-	-0.970
Square of Land Owned	0.172	(1.61)	-	0.068
Land Gini	-106.369	(-2.45)	**	-42.243
Proportion of BPL card holders in a Village	201.499	(5.82)	***	80.023
Ratio of PDS to Market Price (Wheat)	2,096.669	(2.2)	**	832.668
Price Ratio (Wheat) - Squared	-2,652.538	(-2.28)	**	-1,053.425
Distance to FPS	-23.190	(-3.44)	***	-9.210
HH Size	21.402	(2.19)	**	8.500
HH Size - Squared	-1.758	(-1.97)	**	-0.698
No. of Adult Males	7.319	(1.17)	-	2.907
No. of Adult Females	-6.433	(-0.77)	-	-2.555
Agricultural Wage Rate	0.741	(1.6)	-	0.294
Constant	-533.245	(-2.8)		
<i>Sigma</i>	92.055			
<i>Left Censored Observations</i>	230			
<i>Uncensored Observations</i>	253			

**Table 7g: Results of Tobit Estimation (Maharashtra - Rice)**

No. of Observations =	483			
LR-chi2(14)=	61.42	Prob > Chi-2 =	0.000	
Log Likelihood=	-1693.28	Pseudo R2 =	0.018	
<b>Maharashtra - RICE</b>				
	<b>Coefficient</b>			<b>Marginal Effect</b>
Land Owned	-2.491	(-1.08)	-	-0.968
Square of Land Owned	0.099	(0.94)	-	0.038
Land Gini	117.965	(2.64)	***	45.838
Proportion of BPL card holders in a Village	121.567	(3.23)	***	47.238
Ratio of PDS to Market Price (Wheat)	4,477.887	(2.72)	***	1,739.985
Price Ratio (Wheat) - Squared	-5,359.899	(-2.75)	***	-2,082.710
Ratio of PDS to Market Price (Rice)	-2,273.831	(-2.76)	***	-883.549
Price Ratio (Rice) Squared	2,209.008	(2.66)	***	858.360
Distance to FPS	0.227	(0.03)	-	0.088
HH Size	23.433	(2.46)	**	9.105
HH Size - Squared	-1.698	(-1.93)	*	-0.660
No. of Adult Males	1.856	(0.31)	-	0.721
No. of Adult Females	2.619	(0.32)	-	1.018
Agricultural Wage Rate	-0.469	(-0.96)	-	-0.182
Constant	-515.270	(-2.46)		
<i>Sigma</i>	89.261			
<i>Left Censored Observations</i>	228			
<i>Uncensored Observations</i>	255			

**Table 8: Definitions of the variables used in the Tobit analysis**

Variables	Definition
<b>Dependent Variable</b>	
Real Income Transfer from PDS	Real income transfer through PDS is computed separately for each of the three food commodities by multiplying the (Market price - PDS price) by the quantity of food item bought by the household
<b>Explanatory Variables</b>	
Land Owned	Land Owned by Household in acres
Square of Land Owned	Square of Land Owned by Household in acre
Land Gini	Gini Coefficient of land distribution at the village level
Proportion of BPL card holders in a Village	Proportion of BPL card holders in village
Ratio of PDS to Market Price (Wheat)	(PDS Price/Market price) for wheat at Village level
Price Ratio (Wheat) - Squared	Square of Ratio of Village Level PDS to Market price - Wheat
Ratio of PDS to Market Price (Rice)	(PDS Price/Market price) for rice at Village level
Price Ratio (Rice) Squared	Square of Ratio of Village Level PDS to Market price - Rice
Ratio of PDS to Market Price (Sugar)	(PDS Price/Market price) for sugar at Village level
Price ratio (Sugar) - Squared	Square of Ratio of Village Level PDS to Market price - Sugar
Distance to FPS	Distance from village to the nearest FPS in km.
HH Size	Household Size - number of members in the household
HH Size - Squared	Square of Household Size
No. of Adult Males	Number of Adult Males in the Household
No. of Adult Females	Number of Adult females in the Household
Agricultural Wage Rate	Village level wage rate for casual agricultural labourer (Rs per day)
Distance to Nearest Town	Distance from village to nearest town in km.
Distance to Nearest Town - Squared	Square of Distance from village to nearest town in km.
Waiting time at FPS	Total time spent in buying food grains from FPS per month (hours)