Discussion Papers in Economics

The Percolation of Public Expenditure:
Food Subsidies and the Poor in India and the Philippines

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September 2011

Discussion Paper 11-14

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May 2011

Abstract

This paper measures the percolation of food subsidy expenditures to the poor. The paper proposes a metric that takes into account the depth and width of income transfer. The metric is applied to food subsidy expenditures in India and the Philippines. Both countries operate in-kind transfer schemes. The major finding is that neither country scores well on the percolation index. Participation rates are low and households, whether poor or not, do not receive most of the expenditures of the food subsidy. The in-kind subsidies pose particular challenges with respect to illegal arbitrage and fraud and with respect to the excess costs of state agencies. The waste in the food subsidy systems of both countries (of 65% and above) provides a buffer by which coverage can be stepped up substantially without commensurate increase in public expenditures.

The Percolation of Public Expenditure:
Food Subsidies and the Poor in India and the Philippines*

Imagine the following thought experiment. Suppose there is to be a marginal expansion of a food subsidy program. What would be the impact of this policy on the poor? This paper provides some answers to this question for the food subsidy programs of India and the Philippines. The paper puts forward a metric that lies between zero and one. If the marginal impact metric is close to one, it indicates that most of the expenditure percolates to the poor. On the other hand, if the impact metric is close to zero, it indicates the poor receive very little benefit from a marginal expansion of the subsidy program.

Indian economic growth in the 2000s has been in the high single digits and has catapulted the economy into the ranks of the best global performers. The Philippines economic growth has been steady for most of the period. Although deprivation is far greater in India, poverty is a serious problem in both countries and there is debate on whether economic growth has sufficiently trickled down to the poor. In India, there is pressure on policy makers to invest the tax dividends of economic growth on safety net and social sector programs. In both countries, the efficacy of existing anti-poverty programs is a continuing concern. These reasons justify the question posed in the preceding paragraph.

Both India and the Philippines expend significant resources on food subsidies. As in-kind transfer programs, there are many similarities between the two programs. There are some notable differences as well – the most important of which is that the Philippine program is not targeted unlike the Indian program. The value of a comparative analysis between India and the Philippines lies arguably in identifying

generic issues with in-kind transfer schemes that determine the extent to which food subsidy expenditures percolate to the poor.

We follow the literature in quantifying the benefits to households in terms of income equivalents i.e., the implicit income subsidy that is equal to the product of the quantity purchased of the subsidised commodity and the difference between the market and subsidised price (Besley and Kanbur, 1993; Coady, Grosh and Hoddinot, 2004). The academic and policy literature recognizes that the gains to the poor depend on targeting as well as program delivery. So if we think of the flow of resources from government coffers to poor households, then we have to think of how it percolates through the claims of non-poor households and of stakeholders that implement the subsidy program.

However, most of the studies have only evaluated the targeting performance of subsidies. From this literature, it is well known that most transfer programs are costly because of substantial non-target beneficiaries. For instance, from a survey of universal food subsidy schemes, Coady (2002) finds that the median targeting performance implied that the government spent $3.40 to transfer $1.00 to the poor. In their meta-survey of income transfer programs, Coady, Grosh and Hoddinot (2004) conclude that interventions that use some methods of targeting (e.g., means testing, geographic targeting or self-selection in public works) result in the target group receiving a greater share of benefits. Further, a standard policy prescription, especially from multilateral institutions, is to recommend that governments should target subsidies towards the poor and not waste resources subsidising the non-poor.

However, there is no generalized theoretical presumption that policy should always aim to reduce inclusion errors. The literature offers examples where targeting is costly both administratively as well as in economic terms because of incentive effects

(Besley and Kanbur, 1993, Kanbur, 2009). In addition, Gelbach and Pritchett (2000) argued that programs that are tightly targeted towards the poor (i.e., low inclusion errors) do not receive political support from the non-poor and thus are ultimately endangered. In addition, there are the practical difficulties of targeting.

In their meta-survey of studies that evaluate income transfer programs, Coady, Grosh and Hoddinot (2004) found very few studies that looked at how program costs affect the percolation of benefits. And even such information consisted only of administrative costs ignoring the costs due to corruption or theft. In this paper, we quantify the extent to which food subsidy expenditures percolate to the poor taking into account targeting leakages as well as leakages due to deficiencies in program delivery that result in excess costs and fraud.

Our principal finding is that the payoffs to program delivery that reduces waste are much larger than the gains from lower inclusion errors. While opportunities for reducing such errors exist in both India and the Philippines, the payoffs from such policies are distinctly secondary to the payoffs from reduction of waste. We shall argue that such a finding is important because reducing inclusion errors is not only contentious politically but is also a policy recommendation that is accompanied by many caveats in the economics literature. On the other hand, it is straightforward to recommend policies that deliver subsidies more efficiently. Indeed, as we shall see, higher percolation may well require greater inclusion errors.

2. Program Description

India and the Philippines operate food subsidy programs (referred to in this paper by their acronyms Targeted Public Distribution System or TPDS and the National Food Authority or NFA respectively) that have similar mandates and many

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commonalities in functioning as well. The mandates are multiple including price stabilization, ensuring food access by the poor and supporting farm prices. The commonality in functioning is that both these programs deliver in-kind subsidies. The commodities that are subsidized in these programs include staple foodgrains. The Philippines program subsidises mainly rice while the Indian program offers subsidies on rice and wheat.[1]

Table 1 is a descriptive summary of the programs in these two countries. Because of in-kind subsidies, both countries have government agencies that source, store, transport and distribute the grain to designated retail outlets. The TPDS primarily sources grain from domestic procurement while the NFA program depends heavily on imports (over which it has a monopoly).

The NFA is supposed to balance producer and consumer interests. Apart from its monopoly of rice imports, the NFA seeks to boost farm gate prices by buying *palay* or paddy rice from growers and their organizations at a relatively high price compared to the market farm price. To assist consumers, the NFA sells rice through accredited retailers at a mandated, below-market price. The retailers receive a fixed margin on the sale. In the past, consumer prices were generally above free-trade prices (Tolentino, 2002). In addition to procurement, the NFA also carries out buffer stocking, processing activities, dispersal of palay and milled rice to strategic locations and distribution to various marketing outlets.

In India, the central and state governments together run a marketing channel solely devoted to the distribution of the subsidized food. At the retail level, this involves a network of "Fair Price Shops" (FPS) which sell subsidized grain to consumers.

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[1] While these programs also subsidize other consumption goods, we focus on these staples as they account for a major share of the subsidies. .

Subsidized grain is not accessible elsewhere. The FPS is usually run by private agents who receive a fixed percentage as commission for their efforts. The FPS is often restricted to sell only subsidized grain. The Central government is responsible for procurement, storage, transportation and bulk allocation of foodgrains to different states. The state government is responsible for transporting and distributing the grain within the state through the network of FPS.

The NFA rice subsidies are universal with unlimited purchase. However, there are exceptions – within the NFA program is a smaller program called Tindahan Natin Program (TNP). This program operates through dedicated outlets that sell only the NFA subsidised commodities. The program is supposed to favour the setting up of these stores in the poorer regions through geographical targeting. Since 2008, individual-based targeting is also being attempted. In this experiment, which is confined to Metro Manila, the target beneficiaries are families with incomes less than PhP 5000 per month. Such identified households are eligible to 2 kg of rice at subsidised prices.

Despite its universal nature, household expenditure survey (Family Income and Expenditure Survey or FIES) data for 2006 indicates that out of 12 million households, only about 2 million purchase rice, i.e., about 16% of the population. One reason for this could be self targeting through inferior quality. According to World Bank (2001, report card), the NFA mixes good quality rice with poor quality rice for most of its releases. Moreover, retailers may mix the NFA releases of any good quality rice with bad quality rice. Another reason could be the unavailability of the NFA rice in some parts of the country.

India introduced targeted food subsidies in 1997. The current regime is therefore called targeted public distribution system (TPDS).   Subsidies depend on

whether the household is classified as above poverty line (APL), below poverty line (BPL) or poorest of the poor (POP or the *Antayodaya Yojana* program).

All households are entitled to a monthly quota of 35 kg of rice or wheat per month.[2] In principle, the prices of subsidized grain are supposed to be fixed with reference to the government's "economic cost", i.e., the cost incurred by government agencies in procuring, storing, transporting and distributing grain. BPL households are supposed to receive 50% subsidy (i.e., 50% of economic cost) while APL households are not supposed to be eligible for any subsidy at all.[3] The prices for POP households are fixed below that of BPL households and not with reference to economic cost.

Table 2 lists the price of rice and wheat for each category of households and also the economic cost for the most recent years. The subsidized prices in Table 2 were fixed in 2002 on the basis of the principles outlined in the previous paragraph. However, these prices have not yet been subsequently revised. As a result even the APL households in 2008/09 received a subsidy in excess of 50% of economic cost. The qualification to this is that the central government does not guarantee full supply to the state governments for its APL requirements. The actual allocation depends on past purchases and ad-hoc considerations. The total number of households within a state that are eligible to be classified as BPL is made through an expenditure sample survey administered by the Central government.[4]

The list of BPL beneficiaries is prepared through a BPL census. In the latest census of 2002, households received scores based on 13 criteria. The BPL households

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[2] Some states (e.g., Andhra Pradesh, Rajasthan, Karnataka, Tamil Nadu) combine limits below 35 kg with lower prices or expanded coverage or both (Khera, 2011).
[3] In practice, as we shall see later, even APL households receive subsidies and the subsidy to BPL households has exceeded the 50% benchmark.
[4] The initial estimates of the state-wise BPL population was done for 1993/94 as the product of (a) the estimate of the proportion of households that are poor in 1993/94 and (b) the total population in 1995. The latter has since been revised to 2000; however the former estimate has not been revised yet.

were identified as those who fell below a cut-off score (which was decided by the respective state governments). If the total number of BPL identified households exceeds that which is estimated by the Central government, the subsidy on the excess households has to be borne by the State government.

Both India and the Philippines expend significant resources in operating their food subsidy programs. In the case of India, the budgetary cost of food subsidy topped 1% of GDP in 2002 but later came down to around 0.65% towards the end of the decade. The decline happened because of the rapid growth in GDP since about 2003. The Philippines program is heavily dependent on imports and so the cost of the program varies with world prices. The program cost averaged 0.3% of GDP between 2005 and 2008 (Table 1). Because of high world prices for food in 2008, the program absorbed 0.6% of GDP that year.

3. Impact of Food Subsidies on the Poor: A Measure of Percolation

If public expenditure on food subsidies increases marginally, how much of it percolates to the poor? This section posits a measure of percolation. The starting assumption is that there is a clear classification of households into the poor and non-poor.

The simplest way to examine a program for its effectiveness in reaching the poor is to consider its exclusion and inclusion errors. Let r denote the rate of participation of the poor, i.e., the proportion of the poor who participate and receive benefits from the subsidy program. ($1-r$) is the proportion of the poor who do not receive food subsidies. It is called the exclusion error. The inclusion error is defined as the proportion of subsidy recipients who are not poor. A subsidy regime is said to be targeted well if both these errors are low.

Targeting effectiveness is, however, a limited measure of percolation. In particular, inclusion errors only tell us about how many recipients are non-poor but not how much subsidies they get. This problem can be rectified by considering the share of the poor in the subsidy. This is denoted by *s*. It captures the *depth* of percolation (i.e., the extent to which expenditures reach the poor).

s is the targeting measure that is used most widely in studies evaluating income transfer programs and was therefore used by Coady, Grosh and Hoddinot (2004) to compare targeting effectiveness across programs in a meta-survey of different studies. This measure can also be justified as the social valuation of income transferred to poor households, when poor households receive a welfare weight of unity and non-poor households receive a zero welfare weight (Coady, Grosh and Hoddinot (2004)). *s* is negatively related to the inclusion error (Ravallion (2009). Quite clearly, if the inclusion error is zero then the poor receive the entire subsidy.[5] At the other extreme, if the inclusion error is 100%, then the fraction of the subsidy reaching the poor is zero. It can also be shown that *s* captures the impact of a program on the poverty gap per unit of public spending provided that the program does not by itself change the head count measure of poverty and if there are no fiscal costs other than transfers (Besley and Kanbur, 1993; Ravallion, 2009).

For a marginal expansion of public expenditures on food subsidy, it is reasonable to suppose that the share of the poor in the incremental subsidy is the same as the average share, i.e., the marginal share is equal to the average share. In this case, *s* can also be a measure of percolation of public expenditures. It measures the income transfer to the poor for a unit expansion of public expenditures.

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[5] The statement assumes that the entire subsidy is spent on income transfers. If, for instance, some of the subsidy is spent on administrative costs, then the share of subsidy going to the poor is less than one even when there are no inclusion errors.

The share measure is, however, insensitive to the *width* of percolation (i.e., the coverage among the poor). We could have a well targeted program with high *s* but the program may yet have modest impacts on incomes of the poor because of exclusion errors. For instance, suppose *s* = 1 and imagine two scenarios. In scenario *A*, only 10% of the poor receive subsidies. In scenario *B*, subsidies are accessed by 50% of the poor. A unit expansion of public expenditures will lead to a wider percolation in scenario *B* (together with lower per capita individual gains for those receiving subsidies) than in scenario *A*. The share measure cannot accommodate a preference for scenario *B* over scenario *A*.

To motivate our metric of percolation, suppose the policy maker has a welfare function with the following properties: (a) The function is invariant to the incomes of non-poor households (b) The function is increasing in the incomes of each of the poor households and (c) For a given transfer to the poor, the welfare function is increasing in the coverage among the poor, i.e., greater is the number of recipients, higher is the value of the function.

The share measure is consistent with the first two restrictions but not with the third. A percolation measure consistent with all the three restrictions is $Y = rs$ where *r* is the percentage of the poor that participate in the food subsidy program. The measure *Y* lies between zero and one. If either of *s* or *r* is zero, then the metric is zero as well. Similarly, the maximum value of *Y* is 1 which happens when all of the poor participate and when they receive all of the subsidies. When the participation rate is 1, the percolation metric reduces to *s*.

The value of our percolation measure is that it combines the depth and width of income transfer into a single index. However, the metric is not perfect. All non-poor households have zero weight in the welfare function, irrespective of their distance from

the poverty line. The metric also does not explicitly distinguish between poor

households except to the extent that s incorporates the program impact on the poverty

gap for every unit of program budget. It treats s and r symmetrically. For instance, a

transfer to the poorer half of the poor population would be valued the same as the

transfer that is half of this magnitude but to all of the poor.[6] As we shall see, however, a

finer measure of percolation, while desirable, would not materially alter the findings of

this paper.

4. Computing s – the fraction of subsidy received by the poor

Inclusion errors mean that if a government spends $1 on provision of food

subsidy, poor households receive only a fraction of it. Such a diminution in the amount

of subsidy that reaches poor households is called a targeting leakage. While it is

generally agreed that a targeting leakage (due to inclusion errors) should be minimized,

the debate in the income transfers literature is whether and how it can be done. The

debate is enduring because minimizing inclusion errors can be costly (administratively)

and often leads to greater exclusion errors. With such a trade-off, optimal targeting

depends on how much weight the government puts on inclusion error relative to

exclusion error.

However, there can also be other sources of leakage. In particular, the subsidy

received by all households is often less than the expenditure incurred by the

government. In this section, we argue that s – the fraction of subsidy received by the

poor also ought to be adjusted for non-targeting leakages. There is agreement in the

literature on this requirement (Besley and Kanbur, 1993; Coady, 2002) but is generally

ignored usually because of lack of data.

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[6] We owe this observation to David Coady.

Let p be the market price of the food staple and let k be its subsidy price. If q is the total quantity consumed of the subsidised staple, then the income subsidy received by consumers is

(1) $\qquad I = (p - k)q$

The government's cost of food subsidy is denoted by C and it can be written as

(2) $\qquad C = (a - k)Q$

where a is the government's cost of acquisition and distribution of the food staple   and Q is the total supply of subsidised staple that is distributed by the government. Then C can be decomposed as

$$C = ((a - p) + (p - k)Q) = (a - p)Q + (p - k)(q + d)$$

where $d = (Q - q)$ measures the government supplies for distribution that never reach households through the subsidy mechanism. These represent the illegal diversions by intermediaries that profit from arbitraging the difference between the market and subsidy prices. Hence, we have

(3) $\qquad C = (a - p)Q + (p - k)q + (p - k)d = I + (a - p)Q + (p - k)d$

In this analysis, the income subsidy received by all households I is less than the government's cost of providing subsidies because of two components. The second component $(a - p)Q$ on the right hand side of equation (3) reflects the difference between the government's cost of purchase and distribution of grain and the price in the market. We call this *excess* cost. This can arise either because the government buys the food staples at higher prices than the private sector (for example, as a result of price support operations) or because the government is inefficient relative to the private

sector or because of a combination of these reasons. The third component $(p - k)d$ is the cost of illegal diversions.

Finally, I itself can be broken up into two components: the income transfer to the poor (denoted as Y_p) and the income transfer to the non-poor group (denoted as Y_n). Hence we can write (3) as

(4) $\qquad C = Y_p + Y_n + (a - p)Q + (p - k)d$

The fraction of government expenditure received by the poor is therefore

(5) $\qquad s = 1 - [(Y_n / C) + ((a - p)Q / C) + ((p - k)d) / C]$

s is the difference between one and the sum of three kinds of leakages. The first leakage is the targeting leakage, the second source is the leakage due to excess costs and the third leakage is because of illegal diversions of the subsidized staple to open markets. In the sections that follow, we report on estimates for each of these leakages for India and the Philippines and the cumulative outcome for s.

5. Targeting Errors

In what follows below, we define the poor as that part of the population that subsists on expenditures below the official poverty line.

Philippines

The distribution of NFA rice is not targeted. Hence it should be possible in principle to achieve zero exclusion error. Yet, only 25% of the poor received benefits from the subsidy in 2006 (see Table 3). This is a modest improvement over the situation in 2003 where only 20% of the poor participated in the program. Thus the exclusion error of the program continues to be large.

Table 3 also considers the poor/non-poor composition of the population that receives NFA rice. Of the beneficiaries in 2006, 52% are poor while 48% are non-poor. Thus it would seem that the inclusion error is also large even though there has been some improvement from 2003.

Comparing urban and rural areas, the exclusion error is equally large (about 75%) in both urban and rural areas (Table 4). In 2006, the participation rate of the poor was 24.6% in the rural sector and 24.2% in the urban sector. However, the inclusion error is more serious in urban areas than in rural areas. Table 4 shows that that in urban areas, as many as 68% of beneficiaries are non-poor as against 39% in rural sector. The ease of access to NFA accredited retailers, the better supply of NFA rice and lower opportunity costs for the urban rich (who can send household domestics to queue up for NFA rice) may be factors that contribute to higher purchases of NFA rice by the urban non-poor.

Inclusion errors may not be consequential if the non-poor recipient households buy very little NFA rice. To assess this possibility, consider Table 5 which describes the per capita consumption of NFA rice among poor and non-poor recipients. It shows that both poor and non-poor recipient households buy about the same quantities of NFA rice on per capita basis. This suggests that inclusion errors are indeed serious. As annual per capita grain consumption varies from 90 (for the poorest decile) to 140 kg (for the richest households), NFA rice accounts for more than 50% of the rice consumption of poor recipient households and more than one-third of the rice consumption of non-poor recipient households.

A more comprehensive measure of inclusion errors is to consider the share of the poor in NFA rice distribution. Table 6 shows that the poor do receive a greater

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share of NFA rice than their proportion in population. The table confirms that inclusion error is a more serious problem in the urban sector than in the rural sector.

India

The consumption expenditure survey of the National Sample Survey (NSS) provides information about targeting errors. The latest large scale survey that is available is for 2004/05. Based on the survey questions, a household is defined to be a recipient of food subsidies if it purchases subsidised rice or wheat or both during the survey reference period. While the targeted PDS was launched in 1997, it is generally agreed that targeting was not fully accomplished by 1999. Therefore the results from 1999/00 (when the previous large scale expenditure survey was carried out) may be seen as corresponding to a pre-targeting regime while those from 2004/05 refer to a targeted subsidy regime.

Table 7 compares targeting errors from 1999/00 to 2004/05. The table shows a rise in exclusion error and a fall in the inclusion error. However, the changes are small. In 1999/00, the program was not well-targeted. This situation does not change in 2004/05 despite the introduction of targeting in the design of the program.

Table 8 compares exclusion and inclusion errors across urban and rural areas. Exclusion errors are uniformly high at 70% in both sectors while the inclusion errors are higher in rural areas.

Exclusion errors could happen either because households chose not to participate in the program or because of mis-targeting.[7] As mentioned earlier, targeting is based on proxy indicators that are elicited from a household census. Mis-targeting could happen in two ways. First, a poor household may not be classified at all. In this case, the

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[7] Households might not participate because of various reasons such as low quality of publicly provided grain, distance to retail outlets, unavailability of supplies or lack of liquidity.

household does not receive the food eligibility card[8] and cannot make purchases from the public distribution system. Second, even if a household receives a food eligibility card, it may be wrongly classified as an `above poverty line' (APL) household and is not therefore entitled to the larger subsidy offered to households classified as `below poverty line' (BPL) or `poorest of the poor' (POP). The consumption expenditure survey reports whether households possess food eligibility cards and of what type

Let N be the number of poor households. We divide this into three categories: N_1, the number of poor households that do not possess a food eligibility card; N_2, the number of poor households that are classified as APL and N_3 the number of poor households that are classified as either BPL or POP. Let d_i, $i = 1,2,3$ be the number of poor households that purchase food from the PDS in each of these three categories respectively. If d is the total number of poor households that purchase food from the PDS, the participation rate of the poor can be written as

(6) $p_r = (d/N) = (d_1/N_1)(N_1/N) + (d_2/N_2)(N_2/N) + (d_3/N_3)(N_3/N)$

Equation (6) expresses the overall participation rate as the weighted sum of participation rates of the poor in each of the three categories, with the weights being the proportion of the poor in each of the three categories. Notice that the proportion of the poor in categories one and two is evidence of mis-targeting.

Table 9 displays the conditional participation rates and the associated weights for the rural and urban sector. Consider first the rural sector. For poor households that hold either the BPL or POP eligibility card, the participation rate is 61%. This drops sharply to 13% for households with APL eligibility. For households without any eligibility, the participation rate is 4%.[9] The associated weights are 0.4, 0.4 and 0.2

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[8] The food eligibility card is popularly referred to as a `ration card' in India.
[9] Households without eligibility might still access subsidized food supplies using the ration card of others.

respectively. In other words, 60% of the poor are either classified incorrectly as APL or not classified at all (i.e., without eligibility to any subsidy).

If this kind of mis-targeting is eliminated and all poor are classified as either BPL or POP, the participation rate would improve. If the participation conditional on eligibility remains invariant, then the participation rate would nearly double from 31% (total unconditional participation rate) to 61% (conditional participation rate for BPL and POP categories) in the rural sector.   Hence mis-targeting is a major reason for the high exclusion error. Notice, however, that participation does not reach 100% because nearly 40% of poor households do not participate despite eligibility. This underscores there are factors other than eligibility that are also barriers to participation. The analysis for the urban sector is similar: here the gains from correct targeting are greater as the participation rate would rise from 30% to 77%.

If households received subsidised grain, how much did they receive? This question is answered in Table 10 which displays across poor and non-poor households the amount of grain purchased through TPDS. Table 10 shows that the extent of use does not vary between poor and non-poor households. As per capita grain consumption from all sources varies between 10 and 12.5 kg per month for poor and nonpoor households, the TPDS on average accounts for about 40% of total grain consumption of the households that receive subsidies. Note also that for an average family of five, total household monthly consumption is nearly 20 kg which is much less than the entitlement of 35 kg per month.

Table 11 presents the share of poor in total grain quantity distributed through the TPDS.[10] This is compared to the share of the poor in total population. Although the

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[10] The total quantity distributed through TPDS is computed from the household expenditure survey. It is not the total quantity of grain supplied to the TPDS by the government.

quantity share is greater than the population share, the poor receive less than 50% of the total quantity distributed.

6. Leakages (due to illegal diversions)

Because of the price difference between subsidized grain and grain sold through regular marketing channels, there are powerful incentives to arbitrage and make illegal profits. Both countries have various audit and inspection systems to police such theft. Leakages are the illegal diversions of subsidized grain to regular market channels.[11] They are typically estimated by comparing the distribution of subsidized grain from administrative records to the receipt of grain by households calculated from survey data.

For the Philippines, Mehta and Jha (2009) report a 54% gap between the NFA rice supply and reported consumption. While they acknowledge that some of the discrepancy could be because of timing issues in sample survey data, the gap is too large to be due to measurement errors alone. They conclude that the figure "indicates possibly significant pilferage".

For India, using data from 1986-87, Howes and Jha (1992) estimated the average ratio of PDS consumption to supply in 18 major states to be 65%, ranging from 5% in Haryana to 94% in Jammu and Kashmir. That is, on an average there was 35% diversion. There does not seem to have been much of an improvement since then as similar estimates have been derived by other researchers. For example, Ahluwalia (1993) estimated that in 1986/87, 37% of the supply of subsidized rice and 38% of the supply of subsidized wheat were illegally diverted. Dutta and Ramaswami (2001)

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[11] Sometimes leakages are also used to refer to the receipt of subsidized grain by non-target groups. This is a leakage due to targeting error. In this section, we are concerned with leakages due to corruption and fraud.

estimated these figures for 1993/94 for the states of Andhra Pradesh (AP) and

Maharashtra. They found illegal diversions to be of the order of 15% for rice in AP and

30% and 19% respectively for rice and wheat in Maharashtra. A study by Tata

Consultancy Services (1998) found illegal diversions to be 31% and 36% for rice and

wheat at the all-India level in the late 1990s. The Planning Commission study (2005)

that examined leakages in India after the implementation of the targeted PDS concludes

that illegal diversions of rice and wheat at the all India level in 2003/2004 was 37% of

the total supply of subsidized grain meant for the BPL category.

To get more recent estimates of illegal diversions, we use the National Sample

expenditure survey of 2004/05. In that year, the per capita consumption of subsidised

foodgrains was 1.03 kg per month while the per capita supply of subsidised food works

out to be 2.27 kgs per month. This works out to a leakage of 55% of subsidised

foodgrains supply. In 1999/00, these numbers were 1.01 kg and 1.61 kg per month

respectively.[12] These discrepancies are large and suggest a serious problem with

diversions.

Table 12 displays the percentage leakages by commodity and according to the

subsidy category (POP, BPL and APL). The aggregate leakage for rice is 40% and

expectedly diversions are greatest from POP allocations and least for APL allocations. [13]

The aggregate leakage for wheat is 73% and the diversions are high for all the

categories.

7. Excess Costs

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[12] Because of a change in sample design, the 1999/00 estimates of per capita consumption of subsidised food could be an over-estimate.
[13] In comments to the authors, Reetika Khera suggests that grain supplied for the purpose of POP households may be diverted by the states to other households exaggerating the impression of diversion from POP allocations.

All government agencies incur costs in purchase, transport and distribution of subsidized food. Since this is an activity also done by private agents, it is useful to compare government costs with private costs to ascertain the efficiency of government interventions. In their review of literature about distribution costs, Jha and Srinivasan show that private traders operate at costs lower than those incurred by the government agency in the areas of marketing, storage, trade and transport despite several controls and restrictions imposed upon them. [14]

In India, the government publishes the "economic cost" of its intervention agency in procuring, transporting and distributing grain to various stock points. This together with the additional distribution cost to the retail outlets is the government's cost of delivering grain. By comparing it with retail prices of grain, the efficiency of government operations can be evaluated.

Dutta and Ramaswami (2001) used the above methodology to demonstrate that in 1993/94, 27% of government budgetary expenditure on food subsidy in the state of Andhra Pradesh was wasted by inefficiency of government agencies. The figure for the state of Maharashtra in the same year was 16%. A more recent study (Planning Commission, 2005) finds that in the year 2003/04, delivery through the private sector was more efficient in all states except Kerala. The evidence indicates that at the all India level, the government's food subsidy costs would have been lower by 35% if the government costs matched that of the private sector.

In 2004/05, the Central government's economic cost of distributing rice and wheat were Rs. 13.29 and Rs. 10.19 respectively. To this must be added, margins for wholesalers and retailers, and transportation charges at the retail level. We do not have

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[14] Jha and Srinivasan (2004) note that the trading costs and wholesale marketing margins of private traders in 2000-01 were about half those of the government agency for wheat and about three quarters for rice.

estimates of these costs for 2004-05. A comparison of economic costs with retail prices will therefore give a lower bound to the "excess" costs incurred by the government. The NSS consumption expenditure data for 2004/05 provides information about quantities and expenditures on various items by households. A unit value can be derived from this information. As richer households buy higher quality grain, their unit values are higher. Table 13 displays mean unit values for POP, BPL and APL households. Because of large quality variation in rice, prices paid for rice are lowest for POP households and highest for APL households. In wheat, mean prices are about the same between BPL and APL households but are lower for POP households.

As TPDS grain quality is generally considered to be below average, we take the price paid by BPL households to be representative for such quality grain.[15] Comparing with the economic costs of the state agencies in 2004/05 (Rs. 13.29 per kg for rice and Rs. 10.19 for wheat) we obtain the difference as excess cost. The excess cost for rice is Rs. 2.80 per kg and that for wheat is Rs. 0.85 per kg.

Direct measures of government costs do not exist for the Philippines. We construct these measures from the NFA's financial statements. Adding the cost of imported rice, operating expenses and interest, we get the total cost as 40,090 million pesos (Table 14). Dividing by the volume of grain distributed (1.57 million metric tons), we get the per unit cost of NFA's rice distribution as PhP 25.5 per kg. The NFA also publishes the market price as PhP 23.56. Hence the excess cost is PhP 1.95 per kg of rice.

8. Measures of Percolation

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[15] The data also shows that for both commodities at least 75% of the reported unit values are below the economic cost.

In this section, we bring together the various components to fit into the conceptual framework outlined in sections 3 and 4. Table 15 summarizes the targeting performance, illegal diversions and excess cost of the food subsidy schemes in India and the Philippines. It is interesting to note that India's TPDS, despite being a targeted program, brings only one-third of the total subsidy to the poor in contrast to the Philippines' universal program that gives them as much as 60% of the subsidy. The latter also includes relatively fewer non-poor among the beneficiaries while incurring lower excess costs that capture the inefficiency of the government-run program vis-à-vis the private sector. However, the food-subsidy programs in both the countries have similar exclusion errors and diversion of subsidized grain supplies to the market.

The last five rows of Table 16 present the components of equation (4) for the Philippines. Note that the total cost figures obtained here are lower than the published food subsidy figures because the latter includes other items such as the cost of maintaining stocks. In the Indian case, the calculations are a little more cumbersome because of the three layers of subsidy and because of multiple commodities. Tables 17, 18 and 19 lay out the computations and numbers for diversion costs, excess costs and income transfers. The decomposition of subsidy costs into its components is presented in Table 20.

Table 21 displays for India and the Philippines the percolation metric from a unit of public spending on the poor. The share of subsidy going to the poor is 11% and 21% respectively in India and the Philippines. Multiplied by the participation rate, the percolation indices are 0.05 or less.

The pie charts in Figures 2 and 3 graphically display how the subsidy is spent on various components. These figures show that even if inclusion errors were minimized to zero, the share of the poor would rise at most to 35% in Philippines and to 29% in

India. This means that the percolation metric would rise to about 0.09 in both countries. While this would be a significant rise over the existing situation, the percolation metric would still be much closer to zero than to one. This shows that improvements in the percolation index by giving positive utility weights to incomes just above the poverty line would not materially alter the magnitude of percolation.

9. Policy Options

Neither India nor the Philippines score well on the percolation index. Participation rates are low and households, whether poor or not, do not receive most of the expenditures of the food subsidy. The in-kind subsidies offered in India and Philippines pose particular challenges with respect to illegal arbitrage and fraud and with respect to the excess costs of state agencies. It is possible that these problems are generic to in-kind transfer programs. For instance, illegal diversions have also been reported for Indonesia which too has an in-kind food subsidy program. Olken (2006) estimates that minimum leakages in Indonesia are of the order of 18% of the supply of subsidized rice. More realistic assumptions lead to estimates of around 30%.

The impact of food subsidies on the poor can be increased either by increasing the participation rate or by enhancing the fraction of subsidy going to the poor or a combination of the two. Policies aimed at the latter will save resources that could be used to increase the participation rate,

The scope for this can be seen clearly in the Indian case. Figures 3 and 4 plot the scatter and the line of best fit between the participation rates of the poor and the non-poor across Indian states in 1999/00 and in 2004/05. The correlation is visibly very strong and the R^2 is in excess of 0.9 in both years.   Quite clearly, the costs of participation for the poor are positively correlated with the costs of participation of the

non-poor. An ideal targeting system would be one where the costs are high for the non-poor and low for the poor. It is clear that such a system is not in place and if such a system cannot be devised, then the food subsidy system would have to be near-universal if the poor are to participate in large numbers.

The difficulties of devising a targeting system that approximates the ideal are formidable. Most of India's work force is either self-employed as farmers, traders, vendors, craftsmen or they are wage workers in the informal sector of trade and manufacturing. Such employment is characterized by the absence of formal contracts, salary records and tax payments. Means-testing as is practiced in developed countries is impossible. Identification of poverty status depends on proxy indicators of land ownership, habitation, type of housing, and social characteristics. It cannot be expected that these would perfectly correlate with poverty status defined by the official poverty line.

Given that the official poverty line in India measures bare subsistence, can any set of proxy indicators finely differentiate between households above the poverty line and those below it?[16] Table 22 shows that in the universe of households categorized as POP or BPL, 32% in rural and 49% in urban areas have expenditures below the poverty line. This proportion rises to 70 and 77% when we consider households with expenditures below 1.5 times the poverty line. The problem with targeting in India is therefore not so much that grossly ineligible households have been counted in but that many deserving households have been left out. Anecdotes from officials suggest that one reason for this is that the proxy indicators throw up estimates of eligible households far in excess of the estimates of below poverty line households. State

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[16] Jalan and Murgai (2006) show that the proxy indicators used in India to arrive at a census of poor households in 2002 were unable to differentiate between extremely poor and not so poor households. Enlarging the set of proxy indicators to include other household characteristics did not help much possibly because of the bunching of households around the poverty line.

governments are then under pressure to trim the list of eligible households and this bureaucratic process leads to exclusion errors. Indeed, with 78% of the rural population and 61% of the urban population subsisting on expenditures within twice the poverty line, a targeting system that insists on matching the list of subsidy eligible households with the estimates of poverty will likely have large exclusion errors.

The dilemma is that while a move towards enlarging the number of eligible households will increase participation rates and hence percolation, it would also also increase inclusion errors and perhaps decrease the share of the poor in food subsidy expenditures. Fortunately, however, the waste in the food subsidy systems of both countries (of 65% and above) provides a buffer by which coverage can be stepped up substantially without commensurate increase in public expenditures.

It is this reason why efficiency of subsidy delivery is the key to food subsidy reform. This is a much debated issue in India. On the one side are advocates of the public distribution system. They point to the success of states like Chhattisgarh and Tamil Nadu in achieving efficiencies in the public distribution system through a mix of policies (enlarged coverage, nationalizing the ration shops) and information technology systems in policing the movement of grain through the distribution network. On the other side are those who propose that in-kind transfers be replaced with cash transfers. Not only would cash transfers get rid of illegal diversions and excess costs, but they would also remove the distortionary impacts of in-kind transfers on consumption and production.

Cash transfers are often criticised for being mere income transfer programs. In-kind transfers are regarded as more appropriate if the objective is to meet specific targets of food intake. It can be debated whether paternalism should be the guiding principle or whether consumer sovereignty ought to be respected. Transfers of any

kind are fungible in the hands of the beneficiary and it is questionable whether transfers can achieve desired norms of nutritional intake (Jensen and Miller, 2011).[17]

This contest between an untested system (cash transfers) that holds promise to some and fears for others and a tried system (in-kind transfers) that has failed in all but a handful of regions calls for a policy framework that allows for experimentation, learning and adjustment. It would be unfortunate if the prospects for food subsidy reform are held hostage to the usual instincts to govern through uniform formulaic mechanisms.

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[17] See also Kotwal, Murugkar and Ramaswami (2011) for a discussion of the critiques of cash transfer. The paper also lays out a scheme for the design and implementation of cash transfers in India. .

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Table 1: A Comparative Summary of Food Subsidy Programs in India and the Philippines

Program design and functioning	India	Philippines
Main staple commodities	Rice and Wheat	Rice
Volume of grain distributed	32 million tons (2004-2008)	1.6 million tons (2004-2007)
Targeting	Yes – at household level.	No. Universal program with small targeted programs
Quota	Yes. Fixed per household.	No. Unlimited quantities.
Subsidized price	Yes.	Yes.
Source of Supply	Domestic procurement – supplemented by imports in exceptional years.	Largely Imports (rice) supplemented by domestic procurement
Operations	Supply from central government to state warehouses by Food Corporation of India (FCI) Supply from state warehouses to ration shops by state governments	Supply from central government to NFA warehouses to accredited and licensed private retail outlets and institutions and government rolling stores
Funding	Central government budget	Central government budget Official Development Assistance to the Philippine government Loans from the public and private sectors
Budgetary Allocations as % of GDP	0.72% (2004-2007)	0.3% (2005-2008)

Sources: Economic Survey, Government of India; National Food Authority Accomplishment Reports (NFA, various years); National Food Annual Audit Reports (Commission on Audit, various years); CEIC Data Company Ltd., accessed 8 January 2010; author's computations

Table 2: Subsidized Price of Rice and Wheat in India According to Household Type, 2009 (Rupees/Kg)

	POP	BPL	APL	Economic Cost (2007/8)	Economic Cost (2008/09)
Rice (Common Variety)	3	5.65	7.95	15.64	17.9
Wheat	2	4.14	6.10	13.53	13.93

POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Source: Economic Survey, Government of India

Table 3: Exclusion and Inclusion Errors of the NFA Program

Year	Participation rate	Exclusion Error (in %)	% of recipients who are non-poor (inclusion error)
2006	24.5	75.5	48.3
2003	20.2	79.8	56

Source: Computed from Philippine Family Income and Expenditure Surveys

Table 4: Inclusion Error of the NFA Program, By Sector of Residence, 2006

	Exclusion Error	% of recipients who are non-poor – Inclusion Error
Rural	75.4	39
Urban	75.8	68

Source: Computed from Philippine Family Income and Expenditure Surveys

Table 5: Quantity of NFA Rice purchased by Poor and Non-Poor Recipient households, 2006 (Per capita and in kg per year)

	Poor	Nonpoor
Rural Sector	53.3	52.9
Urban Sector	57.2	54.4

Source: Computed from Philippine Family Income and Expenditure Surveys

Table 6: Share of the Poor in Population and in Distribution of NFA Rice, 2006

	Share of the Poor in NFA Rice (%)	Share of the Poor in Population (%)
Rural	70	49
Urban	40	14
All	60	32

Source: Calculated from the 2006 Philippine Family Income and Expenditure Survey.

Table 7. Exclusion and Inclusion Errors in India

	Participation rate	Exclusion Error (in %)	% of Recipients who are Nonpoor (inclusion error)
2004/05	30	70	70
1999/00	36	64	76

Source: Computed from the Expenditure surveys of the National Sample Survey

Table 8. Exclusion and Inclusion Errors in India, by Sector of Residence, 2004/05

	Exclusion Error (in %)	% of recipients who are non-poor – Inclusion Error
Rural	70	73
Urban	70	59

Source: Computed from the Expenditure surveys of the National Sample Survey

Table 9: Decomposition of Participation Rate of Poor

Category	Rural			Urban		
	Conditional Participation Rate I	Proportion of Poor II	Unconditional Participation Rate III = I x II	Conditional Participation Rate I	Proportion of Poor II	Unconditional Participation Rate III = I x II
No Card	0.04	19.57	0.86	0.03	27.83	0.92
APL	0.13	40.52	5.27	0.18	44.83	8.05
BPL+POP	0.61	39.90	24.51	0.77	27.34	20.94
Sum	---	100.00	30.64	--	100.00	29.91

POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Source: Computations from the Expenditure surveys of the National Sample Survey

Table 10: Quantity of Subsidized Grain purchased from TPDS by Poor and Non-Poor Households (Per capita and in kg per month), India - 2004/05

	Poor	Non-Poor
Rural Sector	4.36	4.73
Urban Sector	4.36	4.69

Source: Computations from the Expenditure surveys of the National Sample Survey

Table 11: Share of the Poor in Population and in distribution of Subsidised Foodgrains, India - 2004/05

	Share in Population	Share in Subsidised Foodgrains
Rural Sector	28%	31%
Urban Sector	26%	46%
All	27%	33%

Source: Computations from the Expenditure surveys of the National Sample Survey

Table 12: Illegal Diversions as Percentage of Supply, India-2004/05

	Rice	Wheat
AAY	72	78
BPL	44	70
APL	5	77
Total	40	73

POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Source: Computations using data on supply of subsidized foodgrains from the Ministry of Consumer Affairs, Food and Public Distribution and data from the Expenditure surveys of the National Sample Survey

Table 13: Consumer prices (retail) for Rice and Wheat in India, 2004/05

Household Type	Price paid for Rice (Rs/kg)	Price paid for wheat (Rs/kg)
POP	9.98	8.58
BPL	10.5	9.34
APL	12.03	9.28

POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Note: Prices refer to unit values here.
Source: Computations from the Expenditure surveys of the National Sample Survey

Table 14: Excess Cost in the NFA program, 2006

Volume of Rice Sold (million metric tons)	1.57
Cost of sales (billion pesos)	31.82
Operating Expenses (billion pesos)	3.6
Interest (billion pesos)	4.7
Total cost (billion pesos)	40.12
Per unit acquisition and distribution cost (pesos/kg)	25.48
Market price (pesos/kg)	23.56
Per unit excess cost (pesos/kg)	1.92

P=pesos, kg= kilograms
Sources: National Food Authority 2006 Accomplishment Report (NFA, 2006); authors computations.

Table 15: Summary of Targeting Performance, Illegal Diversions and Excess Cost

	India	Philippines
Exclusion Error (% of Poor)	70	76
Inclusion Error (% of Beneficiaries)	70	48
Share of Poor in Subsidised Grain	33	60
Diversion as % of Supplies	55	54
Excess cost (as % of government cost, rice)	21	8
Excess cost (as % of government cost, wheat)	8	-

Table 16: Decomposition of Subsidy Costs in the Philippines, 2006

1	Market Price (P/kg)	23.56
2	Value of Sales (P Billion)	26.61
3	Volume of Sales (million tons)	1.57
4	Unit Price of Sales (P/kg) (item 2/item 3)	16.92
5	Consumer Subsidy (P/kg) (item 1 - item 4)	6.64
6	Per unit Excess Cost (from Table 14)	1.92
7	Illegal Diversions (million tons) (54% of item 3)	0.85
8	Subsidised rice consumed by households (million tons)	0.72
9	Share of poor in subsidised rice (from Table 6)	0.6
10	Income transfer to poor (item5*item8*item9), P Billion	2.9
11	Income transfer to Nonpoor, P Billion	1.9
12	Cost of illegal Diversions of rice (item 5*item 7), P Billion	5.6
13	Total Excess cost (item 3* item6), P Billion	3.02
14	Total Cost of Subsidy, P Billion (item3*item 6 of Table 14)	13.5

P=pesos, kg= kilograms
Sources: National Food Authority 2006 Accomplishment Report (NFA, 2006); CEIC Data Company Ltd., authors computations

Table 17. Diversion Costs, 2004/05 - India

Rice	POP	BPL	APL	All
Market Price (Rs/ton)	10500	10500	10500	
Sales Price (Rs/ton)	3000	5650	7950	
Consumer Subsidy (Rs/ton)	7500	4850	2550	
Illegal Diversions (million tons)	2.3	4.38	0.15	
Cost of illegal Diversions of rice (Rs. Million)	17250	21243	382.5	38875.5
Wheat	POP	BPL	APL	All
Market Price (Rs/ton)	9340	9340	9340	
Sales Price (Rs/ton)	2000	4140	6100	
Consumer Subsidy (Rs/ton)	7340	5200	3240	
Illegal Diversions (million tons)	1.77	5.23	2.47	
Cost of illegal Diversions of wheat (Rs. Million)	13021.16	27196	8002.8	48219.96
Total cost of illegal diversions				**87095.46**

Rs = rupees, POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Sources: Economic Survey, Government of India; authors' computations

Table 18: Excess Costs in India, 2004/05

	Rice	Wheat	All
Economic Cost (Rs/ton)	13296	10190	
Market Price (Rs/ton)	10500	9340	
Per unit Excess Cost (Rs/ton)	2796	850	
Quantity Sold (million tons)	16.46	12.89	
Total Excess cost, Rs. Million	46033.34	10956.5	**56989.84**

Rs=rupees
Sources: Economic Survey, Government of India; authors' computations

Table 19: Income Transfers, 2004/05 – India

Rice	POP	BPL	APL	All
Market Price (Rs/ton)	10500	10500	10500	
Sales Price (Rs/ton)	3000	5650	7950	
Consumer Subsidy (Rs/ton)	7500	4850	2550	
Consumption of Subsidised Rice (million tons)	0.90	5.65	3.15	
Share of Poor	0.47	0.34	0.21	
Income Transfer to Poor (Rs Million)	3193.30	9415.55	1646.83	14255.68
Income Transfer to Non-Poor (Rs. Million)	3549.20	17986.95	6385.67	27921.82
Wheat	POP	BPL	APL	All
Market Price (Rs/ton)	9340	9340	9340	
Sales Price (Rs/ton)	2000	4140	6100	
Consumer Subsidy (Rs/ton)	7340	5200	3240	
Consumption of Subsidised wheat (million tons)	0.50	2.19	0.73	
Share of Poor	0.53	0.41	0.22	
Income Transfer to Poor (Rs Million)	1922.26	4663.72	509.89	7095.87
Income Transfer to Non-Poor (Rs. Million)	1718.38	6724.28	1855.31	10297.97
Total Income Transfer to Poor (Rs Million)				21351.55
Total Income Transfer to Non-Poor (Rs. Million)				38219.79

Rs = rupees, POP = poorest of the poor, BPL = below poverty line, APL = above poverty line
Sources: Economic Survey, Government of India; authors' computations

Table 20: Decomposition of Subsidy Costs (India, 2004/05)

Income Transfer to Poor (Rs. Million)	21352
Income Transfer to Non-Poor (Rs. Million)	38220
Illegal Diversion Cost (Rs. Million)	87095
Excess cost (Rs. Million)	56990
Total Cost of Subsidy (Rs. Million)	203657

Rs: Rupees
Source: Tables 17-19

Table 21: Percolation to the Poor

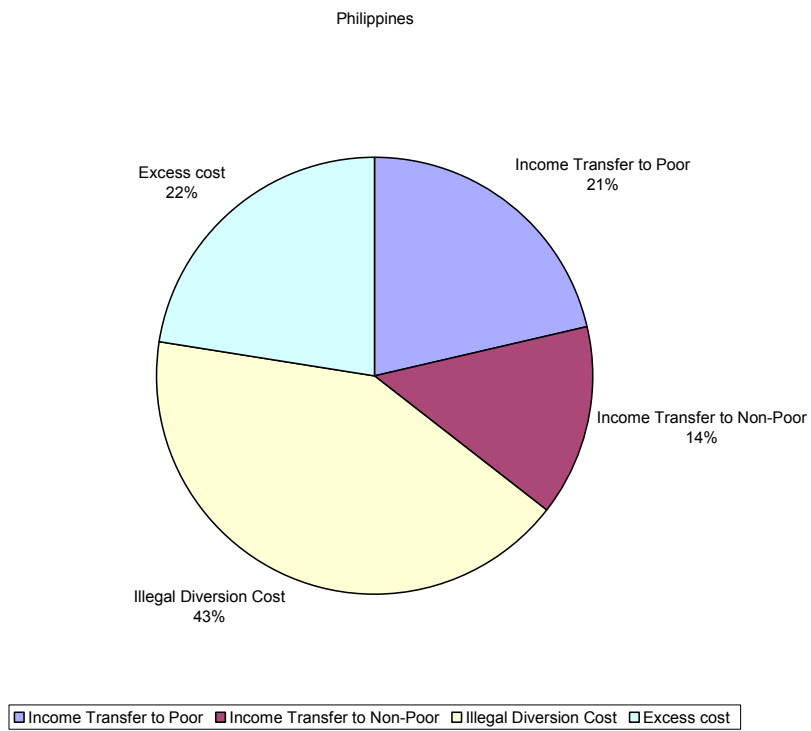|	India	Philippines
Total Subsidy	Rs. 204 billion	P 13.5 billion
Income Subsidy to the Poor	Rs. 21 billion	P 2.9 billion
s - share of subsidy received by poor	0.105	0.214
Participation Rate (% of the poor)	30	24.5
Percolation Index	0.03	0.05

Rs=Rupees,
P = Pesos
Source: Authors' Computations

Table 22: Proportion of Population with POP and BPL eligibility in the following expenditure categories, India, 2004/05

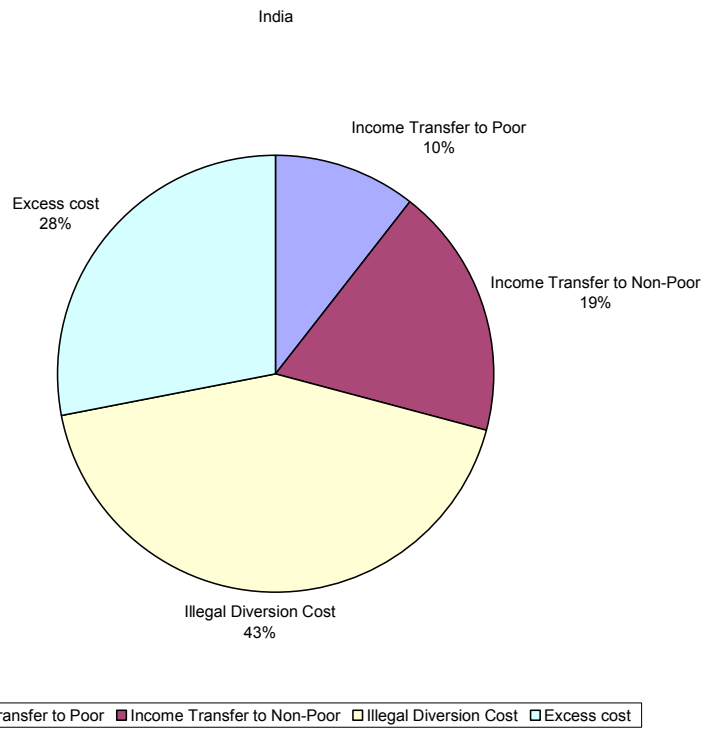| Category	Rural	Urban
Expenditures below Poverty Line	32	49
Expenditures below 1.5 times the Poverty Line	70	78
Expenditures below twice the Poverty Line	87	90

Source: Computed from the Expenditure Survey of the National Sample Survey

Figure 1: Decomposition of Subsidy – Philippines

Philippines

Source: Table 16

Figure 2: Decomposition of Subsidy – India

India

Income Transfer to Poor
10%

Income Transfer to Non-Poor
19%

Illegal Diversion Cost
43%

Excess cost
28%

☐ Income Transfer to Poor ■ Income Transfer to Non-Poor ☐ Illegal Diversion Cost ☐ Excess cost
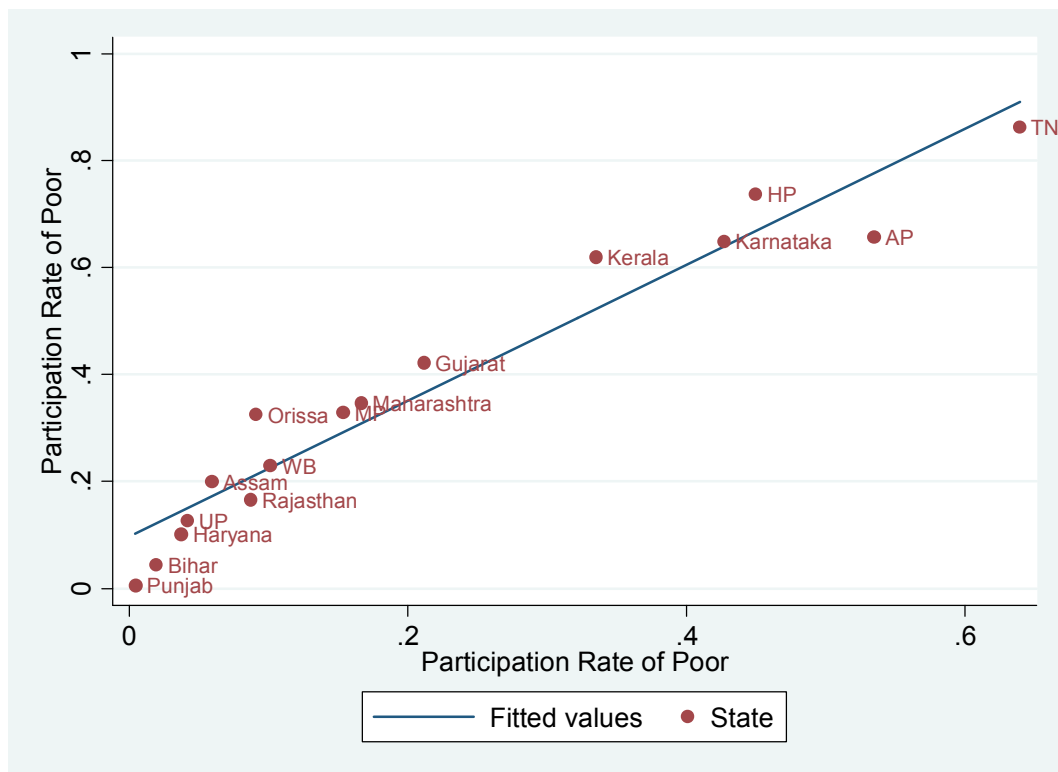
Source: Table 20

Figure 3: Scatter between Participation Rates of Poor and that of Non-Poor in the Public Distribution System, India, 1999/00
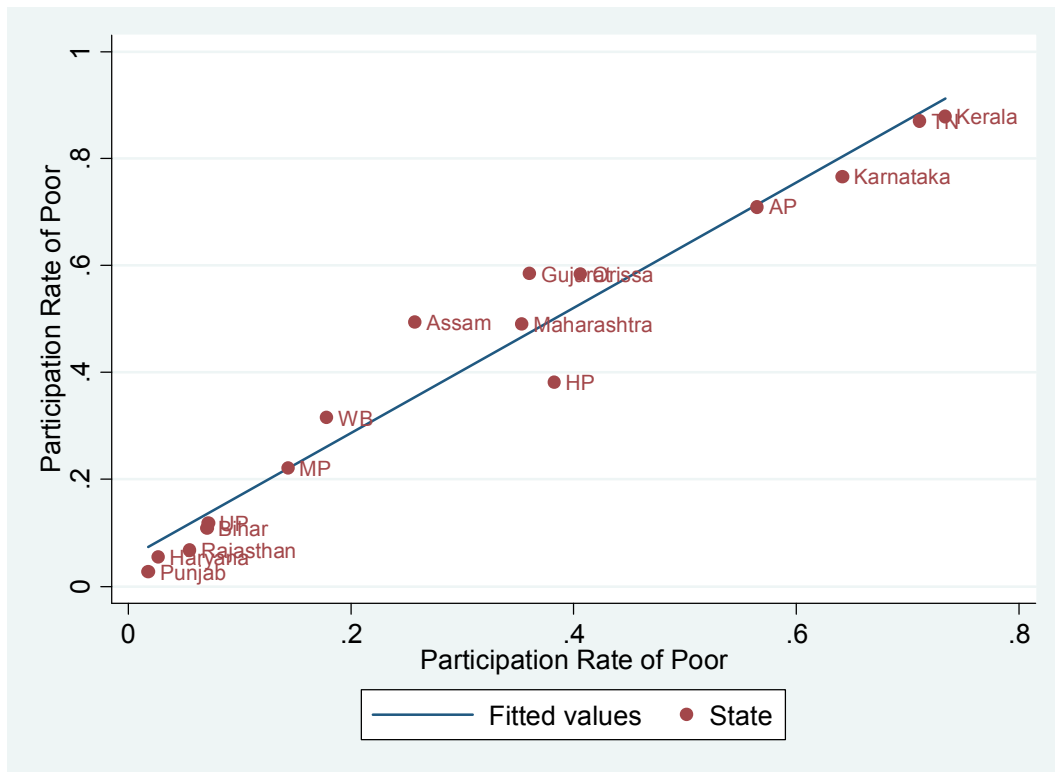
Source: Computed from the Expenditure Survey of the National Sample Survey

Figure 4: Scatter between Participation Rates of Poor and that of Non-Poor in the Public Distribution System, 2004/05

Source: Computed from the Expenditure Survey of the National Sample Survey