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

ABSTRACT The paper measures the percolation of food subsidy expenditures to the poor by defining 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, which operate similar in-kind transfer schemes. The emphasis in the literature has been on reducing inclusion errors. While the metric takes this into account it also captures nontargeting leakages coming from excess costs and fraud. The principal finding is that percolation is poor in both countries and the payoffs from reducing nontargeting leakages are large relative to lowering inclusion errors.

Keywords: *Food Subsidy, In-kind Transfer, Targeting, Excess Cost, India, Philippines*

JEL Classification: *H22, I38, Q18*

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Introduction

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 metric is close to one, it indicates that most of the expenditure from a marginal expansion of the subsidy program percolates to the poor. On the other hand, if the metric is close to zero, it indicates the poor receive very little benefit from a marginal expansion.

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 antipoverty 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 through in-kind transfer programs. As will be discussed later, 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 subsidized commodity and the difference between the market and subsidized price (Besley and Kanbur, 1993; Coady et al., 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 nonpoor 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 nontarget 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 et al. (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 toward the poor and not waste resources subsidizing the nonpoor.

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 toward the poor (i.e., low inclusion errors) do not receive political support from the nonpoor, 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 et al. (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 targeting 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 tolerance of inclusion errors.

Program Description

India and the Philippines operate food subsidy programs, referred to in this paper respectively by their acronyms TPDS or Targeted Public Distribution System (which is spearheaded by the Food Corporation of India [FCI], a

body under the central government) and the NFA or National Food Authority (which too is a central government owned and controlled corporation tasked to ensure food security of the country). The commodities that are subsidized in these programs include staple foodgrains. The Philippines program subsidizes mainly rice while the Indian program offers subsidies on rice and wheat.¹ One key difference is that the TPDS primarily sources grain from domestic procurement while the NFA program depends heavily on imports (over which it has a monopoly). Table 1 presents a descriptive summary of the programs in these two countries, which have similar mandates and many commonalities in functioning as well. The mandates are multiple, including price stabilization, ensuring food access by the poor and supporting farm prices. The two programs are thus expected to balance producer and consumer interests in each country. The commonality in functioning is that both these programs deliver in-kind subsidies. Because of in-kind subsidies, both countries have government agencies that source, store, transport and distribute the grain to designated retail outlets.

In the Philippines, apart from its monopoly of rice imports, the NFA procures *palay* or paddy rice from farmers and farmer organizations at a relatively high price compared to the market farm price. The NFA also carries out other activities such as buffer stocking, processing, dispersal of *palay* and milled rice to strategic locations, and distribution to various marketing outlets through the year. 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 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. Subsidized grain is not accessible elsewhere. The FPS is usually run by private agents who receive a fixed percentage as commission for their sales. 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 supposedly unlimited purchase. However, there are exceptions—within the NFA program is a smaller program called Tindahan Natin Program (TNP). This program operates

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

TABLE 1. A Comparative Summary of Food Subsidy Programs in India and the Philippines

<i>Program design and functioning</i>	<i>India</i>	<i>Philippines</i>
Main staple commodities	Rice and Wheat	Rice
Volume of grain distributed	32 million tons (2004–08)	1.6 million tons (2004–07)
Targeting	Yes—at household level.	No.
Quota	Yes.	Universal program with small targeted programs
Subsidized price	Fixed per household.	No.
Source of supply	Yes.	Unlimited quantities.
Operations	Domestic procurement—supplemented by imports in exceptional years.	Yes.
Funding	Supply from central government to state warehouses by FCI.	Largely imports (rice) supplemented by domestic procurement.
	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.
	Central government budget.	Central government budget.
Budgetary allocations as percentage of GDP	0.72 percent (2004–07)	Official Development Assistance to the Philippine government. Loans from the public and private sectors. 0.3 percent (2005–08)

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 January 8, 2010; author's computations.

through dedicated outlets that sell only the NFA-subsidized commodities. The program is supposed to favor 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 5,000 per month. Such identified households are eligible to 2 kg of rice at subsidized 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 percent of the population. One reason for this could be self-targeting through inferior quality. According to World Bank (2001), 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 moved from a general entitlement scheme (which was widely criticized for its failure to serve the population below the poverty line) to targeted food subsidies in 1997. The current regime is therefore called TPDS. Subsidies depend on whether the household is classified as APL, BPL, or 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 percent subsidy (i.e., 50 percent 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 percent of economic cost. The qualification to this is that the

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 percent benchmark.

TABLE 2. Subsidized Price of Rice and Wheat in India According to Household Type, 2009 (₹/kg)

	<i>POP</i>	<i>BPL</i>	<i>APL</i>	<i>Economic cost (2007–08)</i>	<i>Economic cost (2008–09)</i>
Rice (Common Variety)	3	5.65	7.95	15.64	17.9
Wheat	2	4.14	6.10	13.53	13.93

Source: Economic Survey, Government of India.

Note: BPL = below poverty line, APL = above poverty line, POP = poorest of the poor.

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 were identified as those who fell below a cutoff 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 percent of GDP in 2002 but later came down to around 0.72 percent toward the later part 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 percent of GDP between 2005 and 2008 (Table 1). Because of high world prices for food in 2008, the program absorbed 0.6 percent of GDP that year.⁵

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.

5. Since this study was conducted, it has been decided that the NFA's subsidized distribution program will be gradually phased out (Javier, 2011). NFA's budget has been trimmed down in the light of several inefficiencies that have been highlighted in recent years. Bulk of its operational funds has been reallocated to the Department of Social Welfare and Development to finance its conditional cash transfer program.

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 nonpoor.

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 nonpoor 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 et al. (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 nonpoor households receive a zero welfare weight (Coady et al. [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.⁶ At the other extreme, if the inclusion error is 100 percent, 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, we assume that the share of the poor in the incremental subsidy is the same

6. 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.

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.

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 percent of the poor receive subsidies. In scenario *B*, subsidies are accessed by 50 percent 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 policymaker has a welfare function with the following properties: (a) the function is invariant to the incomes of nonpoor 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 one 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 nonpoor 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.⁷ As we shall see, however, a

7. We owe this observation to David Coady.

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

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 nontargeting 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.

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 subsidized staple, then the income subsidy received by consumers is

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

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

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

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

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

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

$$C = (a - p)Q + (p - k)q + (p - k)d = I + (a - p)Q + (p + k)d \quad (4)$$

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 (4) 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 (e.g., 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 I_p) and the income transfer to the nonpoor group (denoted as I_n). Hence we can write (4) as

$$C = I_p + I_n + (a - p)Q + (p - k)d \quad (5)$$

The fraction of government expenditure received by the poor is therefore

$$s = I - [(I_n/C) + ((a - p)Q/C) + ((p - k)d)/C] \quad (6)$$

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 .

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 percent 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 percent of the poor participated in the program. Thus the exclusion error of the program continues to be large.

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

TABLE 3. Exclusion and Inclusion Errors of the NFA Program

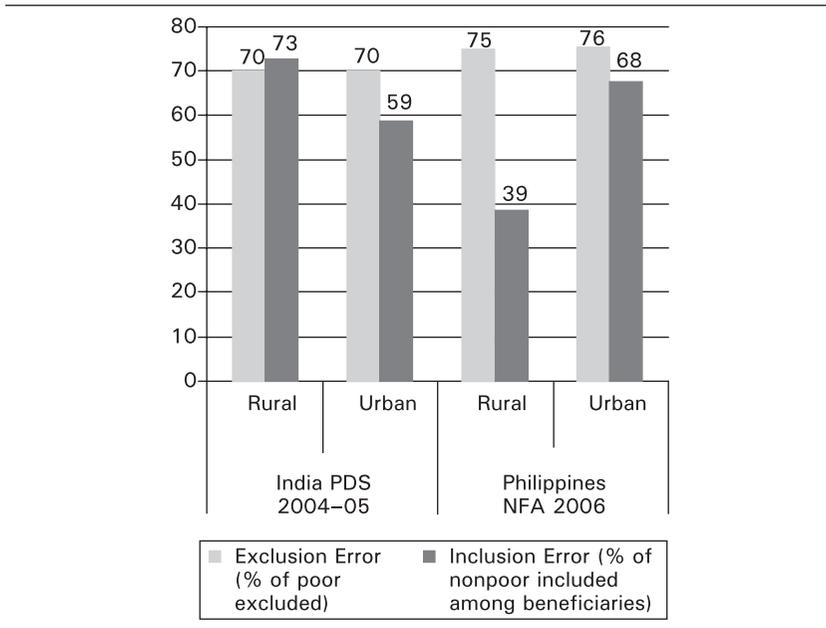
<i>Year</i>	<i>Participation rate</i>	<i>Exclusion error (percentage of poor who are excluded)</i>	<i>Inclusion error (percentage of recipients who are nonpoor)</i>
2006	24.5	75.5	48.3
2003	20.2	79.8	56

Source: Computed from Philippine Family Income and Expenditure Surveys.

Comparing urban and rural areas, the exclusion error is equally large (about 75 percent) in both urban and rural areas (Figure 1). In 2006, the participation rate of the poor was 24.6 percent in the rural sector and 24.2 percent in the urban sector. However, the inclusion error is more serious in urban areas than in rural areas. Figure 1 shows that in urban areas, as many as 68 percent of beneficiaries are nonpoor as against 39 percent 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 nonpoor.

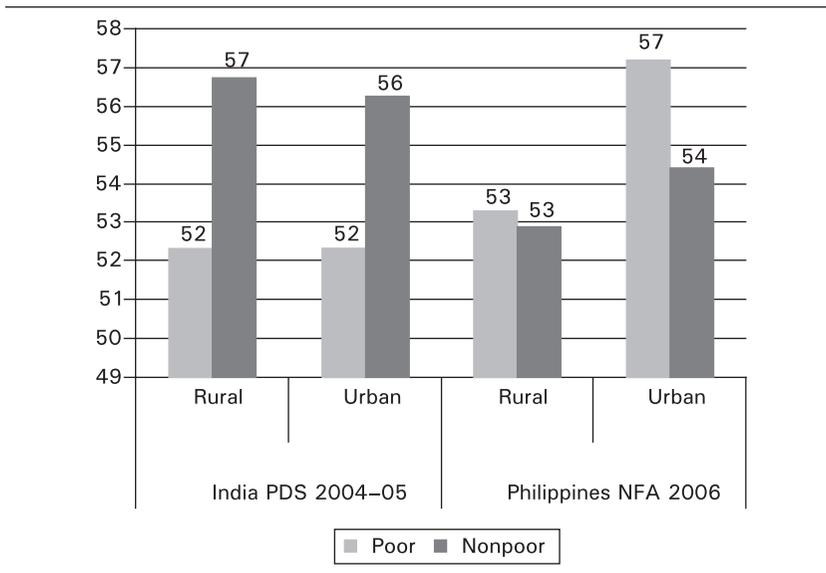
Inclusion errors may not be consequential if the nonpoor recipient households buy very little NFA rice. To assess this possibility, consider Figure 2 which presents the per capita consumption of NFA rice among poor and nonpoor recipients. It shows that both poor and nonpoor recipient households buy about 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 percent of the rice consumption of poor recipient households and more than one-third of the rice consumption of nonpoor recipient households.

FIGURE 1. Targeting Errors, by Sector of Residence



Source: Computations from Expenditure Surveys.

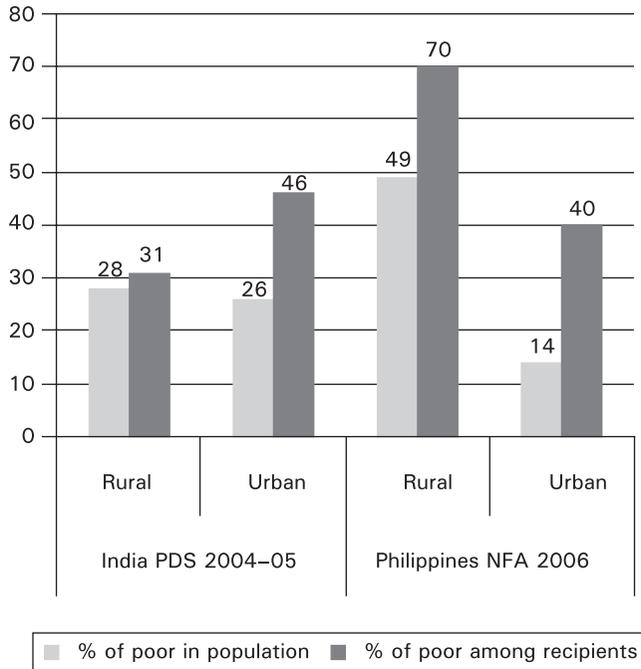
FIGURE 2. Quantity of Subsidized Grains Purchased (kg per capita per year)



Source: Computations from Expenditure Surveys.

A more comprehensive measure of inclusion errors is to consider the share of the poor in NFA rice distribution. Figure 3 shows that the poor do receive a greater 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.

FIGURE 3. Share of Poor in Population and Subsidized Distribution



Source: Computations from Expenditure Surveys.

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 subsidized rice or wheat or both during the survey reference period. While the targeted public distribution system (PDS) was launched in 1997, it is generally agreed that targeting was not fully accomplished by 1999. Therefore, the results from 1999/2000 (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 4 compares targeting errors from 1999/2000 to 2004/05. The table shows a rise in exclusion error and a fall in the inclusion error. However, the changes are small. In 1999/2000, 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 4. Exclusion and Inclusion Errors of TPDS

	<i>Participation rate</i>	<i>Exclusion error (percentage of poor who are excluded)</i>	<i>Inclusion error (percentage of recipients who are nonpoor)</i>
2004/05	30	70	70
1999/2000	36	64	76

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

Figure 1 compares exclusion and inclusion errors across urban and rural areas. Exclusion errors are uniformly high at 70 percent 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.⁸ 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 household does not receive the food eligibility card⁹ and cannot make purchases from the PDS. Second, even if a household receives a food eligibility card, it may be wrongly classified as an APL household and is not therefore entitled to the larger subsidy offered to households classified as BPL or 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 b_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 b is the total number of poor households that purchase food from the PDS, the participation rate of the poor can be written as

8. 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.

9. The food eligibility card is popularly referred to as a "ration card" in India.

$$r = (b/N) = (b_1/N_1)(N_1/N) + (b_2/N_2)(N_2/N) + (b_3/N_3)(N_3/N) \quad (7)$$

Equation (7) 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 an evidence of mis-targeting.

Table 5 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 percent. This drops sharply to 13 percent for households with APL eligibility.¹⁰ For households without any eligibility, the participation rate is 4 percent.¹¹ The associated weights are 0.4, 0.4, and 0.2, respectively. In other words, 60 percent of the poor are either classified incorrectly as APL or not classified at all (i.e., without eligibility to any subsidy).

TABLE 5. Decomposition of Participation Rate of the Poor in TPDS

Category	Rural			Urban		
	Conditional participation rate	Proportion of poor	Unconditional participation rate	Conditional participation rate	Proportion of poor	Unconditional participation rate
	I	II	III = I × II	I	II	III = I × 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

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

Note: APL = above poverty line, BPL = below poverty line, POP = poorest of the poor.

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

10. Given that price for APL cardholders is less than the market price, it may seem somewhat of a puzzle that poor households with such eligibility have such low participation rates. The reason for this outcome is that the central government does not guarantee full grain allocations to the states against the APL category. The actual allocation depends on past purchases and ad hoc considerations. The unpredictable supply to APL grain cardholders dampens their participation.

11. Households without eligibility might still access subsidized food supplies using the ration card of others.

nearly double from 31 percent (total unconditional participation rate) to 61 percent (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 percent because nearly 40 percent of poor households do not participate despite eligibility. This underscores that 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 percent to 77 percent.

If households received subsidized grain, how much did they receive? This question is answered in Figure 2 which displays across poor and nonpoor households the amount of grain purchased through TPDS. Figure 2 shows that the extent of use does not vary between poor and nonpoor households. Per capita grain consumption from all sources varies between 10 and 12.5 kg per month for poor and nonpoor households. Thus, the TPDS on average accounts for about 40 percent 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.

Figure 3 presents the share of poor in total grain quantity distributed through the TPDS.¹² This is compared to the share of the poor in total population. Although the quantity share is greater than the population share, the poor receive less than 50 percent of the total quantity distributed.

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.¹³ 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.

12. 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.

13. 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.

For the Philippines, Mehta and Jha (2009) report a 54 percent 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 to 1987, Howes and Jha (1992) estimated the average ratio of PDS consumption to supply in 18 major states to be 65 percent, ranging from 5 percent in Haryana to 94 percent in Jammu and Kashmir. That is, on an average there was 35 percent 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 percent of the supply of subsidized rice and 38 percent of the supply of subsidized wheat were illegally diverted. Dutta and Ramaswami (2001) estimated these figures for 1993/94 for the states of Andhra Pradesh and Maharashtra. They found illegal diversions to be of the order of 15 percent for rice in Andhra Pradesh and 30 percent and 19 percent, respectively, for rice and wheat in Maharashtra. A study by Tata Economic Consultancy Services (1998) found illegal diversions to be 31 percent and 36 percent 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 diversion of rice and wheat at the all-India level in 2003/04 was 37 percent 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 subsidized food grains was 1.03 kg per month while the per capita supply of subsidized food works out to be 2.27 kg per month. This works out to a leakage of 55 percent of subsidized foodgrains supply. In 1999–2000, these numbers were 1.01 kg and 1.61 kg per month, respectively.¹⁴ These discrepancies are large and suggest a serious problem with diversions.

Table 6 displays the percentage leakages by commodity and according to the subsidy category (POP, BPL, and APL). The aggregate leakage for rice is 40 percent and expectedly diversions are greatest from POP allocations and least for APL allocations.¹⁵ The aggregate leakage for wheat is 73 percent and the diversions are high for all the categories.

14. Because of a change in sample design, the 1999–2000 estimates of per capita consumption of subsidized food could be an overestimate.

15. 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.

TABLE 6. Illegal Diversions as Percentage of Supply, India—2004/05

	<i>Rice</i>	<i>Wheat</i>
POP	72	78
BPL	44	70
APL	5	77
Total	40	73

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.

Note: APL = above poverty line; BPL = below poverty line, POP = poorest of the poor.

Excess Costs

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.¹⁶

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 percent of government budgetary expenditure on food subsidy in the state of AP was wasted by inefficiency of government agencies. The figure for the state of Maharashtra in the same year was 16 percent. 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 percent 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 ₹13.29 and ₹10.19, respectively. To this must be added

16. 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.

margins for wholesalers and retailers, and transportation charges at the retail level. We do not have 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 7 displays mean unit values for POP, BPL, and APL cardholding 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.

TABLE 7. Mean Unit Values for Rice and Wheat in India, 2004/05

<i>Household type</i>	<i>Price paid for rice (₹/kg)</i>	<i>Price paid for wheat (₹/kg)</i>
POP	9.98	8.58
BPL	10.5	9.34
APL	12.03	9.28

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

Note: Prices refer to unit values here: APL = above poverty line, BPL = below poverty line, POP = poorest of the poor.

As TPDS grain quality is generally considered to be below average, we take the price paid by BPL cardholding households to be representative for such quality grain.¹⁷ Comparing with the economic costs of the state agencies in 2004/05 (₹13.29 per kg for rice and ₹10.19 for wheat), we obtain the difference as excess cost. The excess cost for rice is ₹2.80 per kg and that for wheat is ₹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 8). 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 1.92 per kg of rice.

17. The data also shows that for both commodities, at least 75 percent of the reported unit values are below the economic cost.

TABLE 8. 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

Sources: NFA (2006); authors computations.

Note: kg = kilograms.

Measures of Percolation

In this section, we bring together the various components to fit into the conceptual framework outlined in sections three and four. Table 9 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 percent of the subsidy. The latter also includes relatively fewer nonpoor 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.

TABLE 9. Summary of Targeting Performance, Illegal Diversions and Excess Cost

	<i>India</i>	<i>Philippines</i>
Exclusion error (percentage of poor)	70	76
Inclusion error (percentage of beneficiaries)	70	48
Share of poor in subsidized grain	33	60
Diversions as percentage of supplies	55	54
Excess cost (as percentage of government cost, rice)	21	8
Excess cost (as percentage of government cost, wheat)	8	–

Source: Our computations from expenditure surveys and official documents as reported in text and Tables 3, 4, 6, 7, and 8.

The last five rows of Table 10 present the components of equation (5) 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

TABLE 10. 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 8)	1.92
7	Illegal diversions (million tons) (54 percent of item 3)	0.85
8	Subsidized rice consumed by households (million tons)	0.72
9	Share of poor in subsidized rice (from Figure 1)	0.6
10	Income transfer to poor (item 5 × item 8 × item 9), 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 × item 6), P billion	3.02
14	Total cost of subsidy, P billion	13.5

Sources: NFA (2006); CEIC Data Company Ltd., authors computations.

Note: P = pesos, kg = kilograms.

a little more cumbersome because of the three layers of subsidy and because of multiple commodities. Tables 11, 12, and 13 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 14.¹⁸

TABLE 11. Diversion Costs, 2004/05—India

	<i>POP</i>	<i>BPL</i>	<i>APL</i>	<i>All</i>
<i>Rice</i>				
Market price (₹/ton)	10,500	10,500	10,500	
Sales price (₹/ton)	3,000	5,650	7,950	
Consumer subsidy (₹/ton)	7,500	4,850	2,550	
Illegal diversions (million tons)	2.3	4.38	0.15	
Cost of illegal diversions of rice (₹ million)	17,250	21,243	382.5	38,875.5
<i>Wheat</i>				
Market price (₹/ton)	9,340	9,340	9,340	
Sales price (₹/ton)	2,000	4,140	6,100	
Consumer subsidy (₹/ton)	7,340	5,200	3,240	
Illegal diversions (million tons)	1.77	5.23	2.47	
Cost of illegal diversions of wheat (₹ million)	13,021.16	27,196	8,002.8	48,219.96
Total cost of illegal diversions				87,095.46

Sources: Economic Survey, Government of India; authors' computations.

Note: ₹ = rupees, APL = above poverty line, BPL = below poverty line, POP = poorest of the poor.

18. It is well known that NSS aggregate population counts are lower than the Census total. In the estimates displayed here, the estimates of consumption from NSS are blown up to the Census numbers.

TABLE 12. Excess Costs in India, 2004/05

	<i>Rice</i>	<i>Wheat</i>	<i>All</i>
Economic cost (₹/ton)	13,296	10,190	
Market price (₹/ton)	10,500	9,340	
Per unit excess Cost (₹/ton)	2,796	850	
Quantity sold (million tons)	16.46	12.89	
Total excess cost, ₹ million	46,033.34	10,956.5	56,989.84

Sources: Economic Survey, Government of India; authors' computations.

Note: ₹ = rupees.

TABLE 13. Income Transfers, 2004/05—India

	<i>POP</i>	<i>BPL</i>	<i>APL</i>	<i>All</i>
<i>Rice</i>				
Market price (₹/ton)	10,500	10,500	10,500	
Sales price (₹/ton)	3,000	5,650	7,950	
Consumer subsidy (₹/ton)	7,500	4,850	2,550	
Consumption of subsidized rice (million tons)	0.90	5.65	3.15	
Share of poor	0.47	0.34	0.21	
Income transfer to poor (₹ million)	3,193.30	9,415.55	1,646.83	14,255.68
Income transfer to nonpoor (₹ million)	3,549.20	17,986.95	6,385.67	27,921.82
<i>Wheat</i>				
Market price (₹/ton)	9,340	9,340	9,340	
Sales price (₹/ton)	2,000	4,140	6,100	
Consumer subsidy (₹/ton)	7,340	5,200	3,240	
Consumption of subsidized wheat (million tons)	0.50	2.19	0.73	
Share of poor	0.53	0.41	0.22	
income transfer to poor (₹ million)	1,922.26	4,663.72	509.89	7,095.87
Income transfer to nonpoor (₹ million)	1,718.38	6,724.28	1,855.31	10,297.97
Total income transfer to poor (₹ million)				21,351.55
Total income transfer to nonpoor (₹ million)				38,219.79

Sources: Economic Survey, Government of India; authors' computations.

Note: ₹ = rupees, APL = above poverty line, BPL = below poverty line, POP = poorest of the poor.

TABLE 14. Decomposition of Subsidy Costs (India, 2004/05)

Income transfer to poor (₹ million)	21,352
Income transfer to nonpoor (₹ million)	38,220
Illegal diversion cost (₹ million)	87,095
Excess cost (₹ million)	56,990
Total cost of subsidy (₹ million)	203,657

Source: Tables 11–13.

Note: ₹ = rupees.

Table 15 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 percent and 21 percent, respectively, in India and the Philippines. Multiplied by the participation rate of the poor, the percolation indices are 0.05 or less.

Table 15. Percolation to the Poor

	<i>India</i>	<i>Philippines</i>
Total subsidy	₹ 204 billion	P 13.5 billion
Income subsidy to the poor	₹ 21 billion	P 2.9 billion
s—share of subsidy received by poor	0.105	0.214
Participation rate (percentage of the poor)	30	24.5
Percolation index	0.03	0.05

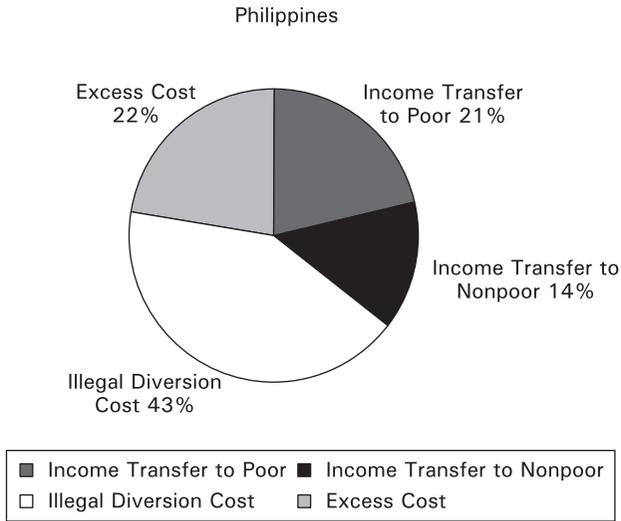
Source: Authors' computations.

Note: ₹ = rupees, P = pesos.

The pie charts in Figures 4 and 5 graphically display how the subsidy is spent on various components. Interestingly, the illegal diversion is identical, and the excess costs are similar between the two programs. While the poor's participation rates are similar as well, there is a striking difference between the NFA and the TPDS on the share of subsidy going to the poor. We put forth three reasons to explain why the share in TPDS is only half of that in NFA although the NFA is a universal program. All the three reasons reflect indirect targeting. First, NFA rice is, by law, clearly labeled as such. This may attach a stigma to the rich who often buy it from supermarkets or malls where it is retailed. Second, anecdotal evidence suggests that an informal quota of 5 kg per head is implemented in practice though there is no limit on the number of times one may queue up. This would add significantly to the opportunity cost of the nonpoor. Third, the NFA has procedures for renewing retailers' accreditation, which may not be granted if consumers complain enough (Mehta and Jha, 2010).

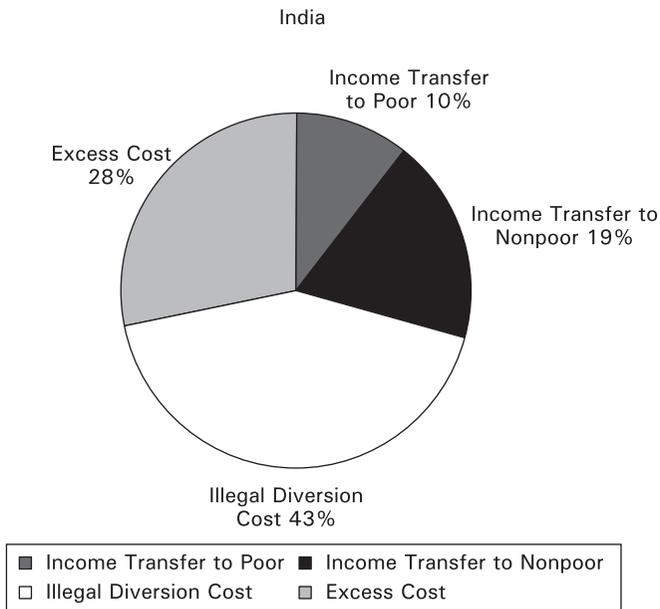
Figures 4 and 5 show that even if inclusion errors were minimized to zero, the share of the poor in the subsidy would rise at most to 35 percent in Philippines and to 29 percent in India. This means that the percolation metric would rise to about 0.09 in both countries. While this would be a significant 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.

FIGURE 4. Decomposition of Subsidy—Philippines



Source: Table 10.

FIGURE 5. Decomposition of Subsidy—India



Source: Table 14.

Assumptions and Robustness Checks

In this section, we record the assumptions and caveats to our methodology. We also report the robustness of our results to alternative assumptions.

Like much of the literature, this paper has also assumed that leakage (illegal diversions) is the difference between official recorded sales of subsidized grain and consumption of such grain as estimated from expenditure survey data. This may be misleading if expenditure survey data systematically underestimates consumption. In the case of India, the report on long-term grain policy (Government of India, 2002) compared the per capita annual consumption of rice and wheat (in kg) from expenditure survey data with the official estimates of per capita availability of these cereals (i.e., production minus different uses which are for seed, feed, waste, industrial use, net exports, and change in public—but not private—stocks and waste). The report found that the two figures match each other closely for the period 1991–2001.¹⁹ We performed a similar calculation for the survey year of our interest, 2004/05. The estimate of net availability is 390 grams per capita per day while the estimate from the NSS consumption survey is 386 grams per capita per day. There is, therefore, little reason to fear any substantial bias from the method of computing leakage.

A second possible concern is that the methodology for decomposing public expenditures into various components (Figure 4) needs to identify a market price to compute the subsidy received by households and the excess costs incurred by the government. In the case of the Philippines, we rely on market price data published by the NFA. We do not have similar authoritative data for India. Instead, we used the average of prices paid by BPL households for market grain as the price that is most comparable to the quality of grain sold in the TPDS. The logic of this procedure is that purchased grain quality (and hence prices) varies directly with household income and that TPDS grain is generally considered to be of low quality. However, the identification of the market price as price paid by BPL households is arbitrary.

From equation (4), it can be seen that at the margin, a higher market price will reduce excess cost and increase the income transfer to households. However, this also results in a greater share of illegal diversions in public expenditures. Overall, the amount of income transfer goes up by $q \Delta p$ and total program waste (sum of leakages and excess cost) falls by the same amount. Suppose the market price of rice is identified as the 75th percentile

19. See Annexure II of the report.

of the distribution of unit values in the survey data. Suppose also a similar assumption for wheat. Under these assumptions, the market price of rice is ₹12.66 per kg while that of wheat is ₹10 per kg. These are improbably high values for TPDS quality grain—nonetheless, it is worth seeing how the estimates change. Given the estimates of q , these market prices imply that the total income transfer goes up by ₹23,209 million while the program waste falls by the same amount. In terms of the pie chart in Figure 4, the income transfer to households rises from 29 percent to 40 percent. While this is a substantial rise, program waste still accounts for 60 percent of all public expenditures. Within this category, the share of excess costs falls while that of leakages increases.

We also considered another alternative procedure which again produces upper bounds on the amount of public expenditures transferred to households. The prices that households pay vary both spatially and temporally. Consequently, the subsidy received by households would also vary similarly. To take this into account, we consider the subsidy received by households as the product of the quantity purchased from TPDS and the difference between the prices paid for market and subsidized grain. This would be accurate as long as the market grain is of the same quality as subsidized grain. However, if households buy grain of varying quality, this procedure will overestimate the subsidy received especially by richer households.

A complication in applying this procedure is that about 4.4 percent of households buy grain exclusively from the PDS. For these households, a market price must be imputed to calculate the subsidy received by them. For this reason, we follow Deaton (1997) in regressing unit values on household expenditure, household size, and village fixed effects (or urban block in urban areas). From this equation, we obtain predicted unit values for all households in the sample. These are used as the relevant market prices to compute the subsidy income received by households. By this procedure, the aggregate subsidy received by households rises to ₹68,640 million (from ₹59,572 million) in the benchmark estimates reported in Table 14.²⁰ The proportion of public expenditures received by households rises to 34 percent from 29 percent reported in Figure 4. In conclusion, neither of these procedures, that are engineered to estimate an upper bound on the income subsidies to households, results in estimates that warrant revision of the qualitative story told by the benchmark estimates of Table 14 and Figure 4.

20. Once again, as in the benchmark case, the numbers are adjusted upward to take account of the downward bias in NSS population aggregates (relative to the Census).

It should be understood, however, that our estimates of percolation apply only to incremental changes in public expenditure. The methodology implicitly assumes that the average participation rates and the share of income transfer going to the poor (from equation [6]) are valid for the increment in public expenditures. Lanjouw and Ravallion (1999) point out that the average participation rate of the poor in antipoverty programs may in fact be a poor guide to their marginal participation rate induced by additional public spending. In particular, if there is early capture of these programs by the nonpoor, then it could well be that the average participation rate of the poor severely underestimates their marginal rate. Lanjouw and Ravallion use cross-sectional variation in participation rates to illustrate their thesis for antipoverty programs in India, such as public works and asset transfers. Notably, however, they find that average participation rates do not differ much from marginal participation rates for the public distribution system. Even otherwise, the relevance of their argument is limited in a world where most of the public expenditure is absorbed by illegal diversion and excess costs.

It should be clear, however, that this paper's methodology is entirely partial equilibrium in nature. This applies especially to our computation of subsidy and excess cost. It could be argued that the subsidy received by households should be evaluated with respect to a counter-factual: what would market prices be if there were to be either no intervention or an intervention of a different form (say, food stamps or cash transfers). Such a general equilibrium analysis is not attempted here.

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 percent of the supply of subsidized rice. More realistic assumptions lead to estimates of around 30 percent.

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.

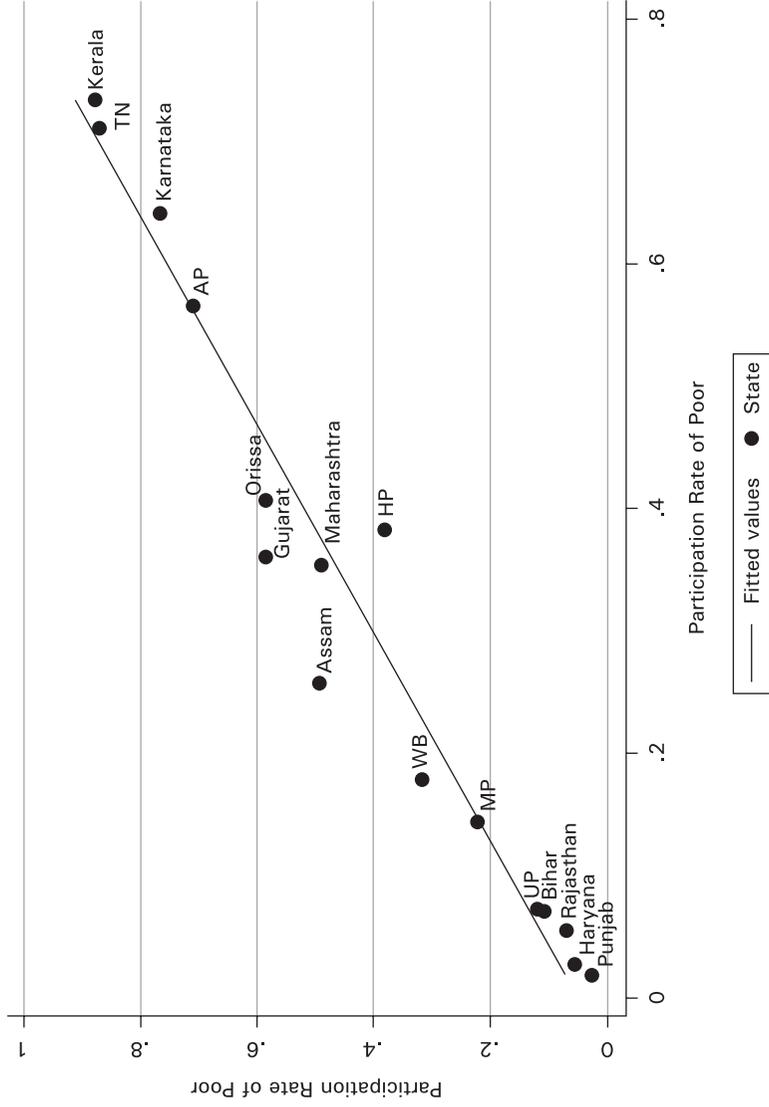
The scope for this can be seen clearly in the Indian case. Figures 6 and 7 plot the scatter and the line of best fit between the participation rates of the poor and the nonpoor across Indian states in 1999/2000 and in 2004/05. The correlation is visibly very strong and the R^2 is in excess of 0.9 in both years. Quite clearly, the costs of participation for the poor are positively correlated with the costs of participation of the nonpoor. An ideal targeting system would be one where the costs are high for the nonpoor 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 waged 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?²¹ Table 16 shows that in the universe of households that are deemed to be eligible for either POP or BPL benefits, 32 percent in rural and 49 percent in urban areas have per capita consumption expenditures below the poverty line. In other words, 68 percent of POP/BPL households in the rural sector and 51 percent of such households in urban areas are not poor (by the official poverty line). This suggests that inclusion errors are serious in the distribution of POP and BPL eligibility cards. However, the table also shows that 70 percent of POP/BPL rural households

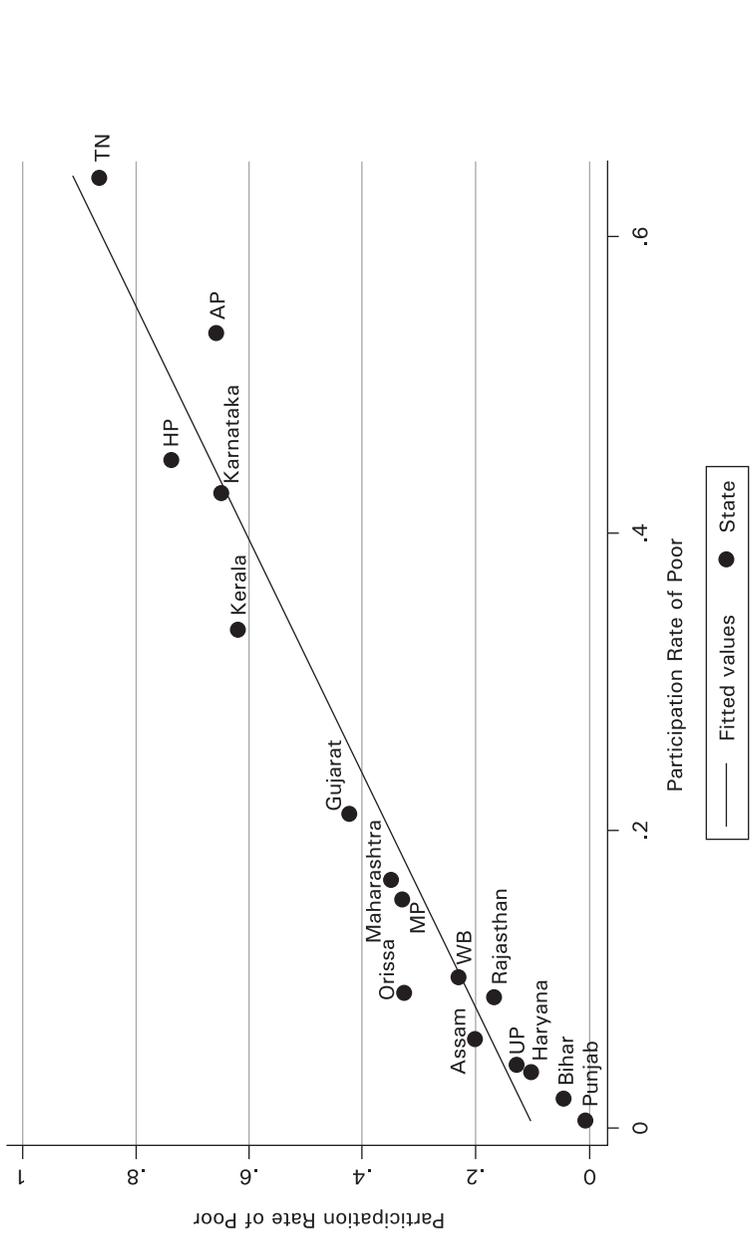
21. Jalan and Murgai (2006) show that the proxy indicators used in India to arrive at a census of poor households in 2002 were unable to differentiate between extremely poor and not-so-poor households. Enlarging the set of proxy indicators to include other household characteristics did not help much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

FIGURE 6. Scatter between Participation Rates of Poor and That of Nonpoor in the Public Distribution System, India, 1999/2000



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

FIGURE 7. Scatter between Participation Rates of Poor and That of Nonpoor in the Public Distribution System, 2004/05



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

TABLE 16 . Proportion of Population with POP and BPL Eligibility in the Following Expenditure Categories, India, 2004–05

<i>Category</i>	<i>Rural</i>	<i>Urban</i>
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.

(and 78 percent in urban) are those with per capita consumption expenditures below 1.5 times the poverty line. Many of the nonpoor with POP or BPL cards are those with per capita expenditures just above 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 BPL households. State governments are then under pressure to trim the list of eligible households to match BPL estimates and this bureaucratic process leads to exclusion errors. Indeed, with 78 percent of the rural population and 61 percent of the urban population having per capita expenditures less than 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 toward enlarging the number of eligible households will increase participation rates and hence percolation, it would 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 percent 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. One option is to continue with in-kind transfers and to reform the public distribution system in the direction of greater efficiency. Advocates of such policies 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. Such policies require sustained political and bureaucratic commitment to the supervision of the supply chain and it is not clear that this is replicable by other states. Another option is to insist on reliable authentication of retail transactions

with the use of smart cards and/or biometric identification. Such authentication would make it difficult to divert grain from genuine beneficiaries. These reforms, however, would not directly attack the problem of excess costs.

On the other side of the debate 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 criticized 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. However, transfers of any kind are fungible in the hands of the beneficiary, and it is questionable whether in-kind or cash transfers can achieve desired norms of nutritional intake (Jensen and Miller, 2011). The more serious critiques against cash transfers are that it calls for a reliable infrastructure of payment systems (whether through post offices, banks, or other means) and that it must be price-indexed if their value is not to erode over time.²²

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. Such a policy framework runs against the bureaucratic impulse to govern through uniform formulaic mechanisms.

More fundamentally, there are formidable political economy obstacles. Government procurement of grain is a powerful symbol of its commitment to rice and wheat growers. Direct income transfers to consumers also support foodgrain demand, but it lacks the visible assurance to counter the political mobilization that is possible with a demand for support prices. For this reason, the central government cannot be seen as dismantling in-kind transfers. Reforms are more likely if individual states (especially those that import food from other parts of the country) have the freedom to tailor the food subsidy system to their needs. At the state level, the political economy is straightforward. The government will have to weigh the political gains of an effective food subsidy regime against the lobby that derives substantial rents from the distribution of subsidized grain. The demonstration power of a single success will make it harder for state governments to resist success.

22. See also Kotwal et al. (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.

Comments and Discussion

Surjit Bhalla

Oxus Investments Pvt. Ltd.

Though we have not conferred, my comments are very similar to Rinku's and I am in substantial agreement with most of what she said. The paper has some important findings and my comments will be more in the nature of what can be done more. There is no problem that I see in the percolation index. I do not know whether that was a mandate that you got from NCAER, etc., but this is what I would encourage. Let me illustrate from that.

First, and most important, what is missing in the paper is an emphasis on the political economy of the system and in schemes like the PDS. As mentioned in the paper, Kirit Parikh (1994) documented the nonworkings of the PDS. Despite several additional investigations, the basic conclusion has not changed. PDS has not worked; so the question is: Why is the political economy background of the PDS not evaluated in detail? Let me try and suggest what I mean by the "political economy of PDS" and what can be done.

First and foremost, why do we need, in order to have a food subsidy program, something called the FCI? Why is that necessary? Is there any country in the world that has a similar program? It does not seem like Philippines has anything even comparable. In India, the government sets the procurement prices, collects the foodgrains via the FCI, stores the food, and then distributes the foodgrains on the basis of whether you are poor or not and does so via only government-authorized ration shops. The idea is that if you want to distribute food to the poor at a subsidized price, why is the simple solution not adopted in India—any food shop can distribute the food and the recipients have an allocation, e.g., food stamps? This does not involve the FCI, nor procurement policies, nor government ration shops.

Second, as far as the political economy is concerned and the historical record, the paper has no mention of the two countries that have practiced food subsidies for a very, very long time. US instituted the food stamp program in the mid-1960s and Sri Lanka in 1979. In India, the problem with the policymakers as well as the policies is that we believe we are *sui generis*, we are unique and that nobody else has faced this problem. But they have and they do. How has the performance of these two countries been with

the food stamp program? What kind of leakages they have in their system versus the leakages in our own system? A political economy treatment will involve such evaluations.

The question remains: what do we do now? Several possibilities, especially if we want to do something constructive. To prevent leakages (via purchase of food stamps or even the present system), why not distribute only low-quality foodgrains? An alternative policy is cash transfers. What are the objections to cash transfers? One objection is that cash transfer recipients may not have bank accounts. Here is an alternative which should be considered but which the political economy may not allow. Let panchayats be responsible for the distribution of the food or the money or whatever else. If the panchayat leaders are leaky, the people, the media, the nongovernmental organizations (NGOs), the World Bank, Asian Development Bank (ADB), etc., can expose them. A third option, but not political economy correct option, is to target the entire population in the 33 percent poorest districts of India. Why has this option not been considered? What is the problem with this recommendation?

Last, the unique identification (UID) program. Look at the political economy of this extremely worthwhile program. Again, the lobbyists have begun to discredit this program. They claim (and many of these anti-UID lobbyists are part of the government, part of the intellectual National Advisory Council [NAC] elite), that such a program invades privacy, cannot work in a country like India, etc. We are argumentative Indians; we are Indians who argue without any knowledge of facts because facts are not relevant. What I would suggest to the authors is that they take the arguments against UID, or cash transfers, of experts like Mr Jean Dreze, and Mr N.C. Saxena. If the facts support the views of these experts, it will embellish the paper; if the facts reject, it will embellish the paper.

Rinku Murgai

The World Bank

This is an interesting paper which raises some important empirical and policy issues. The paper looks at the extent to which expenditures on food subsidies reach the poor in India and the Philippines. The authors modify a commonly used measure of targeting, the share of subsidy that accrues to the poor, to propose a percolation index which combines the share that accrues to the poor with the percentage of the poor that receive the subsidy.

This is meant, in their words, “to capture the impact of a marginal expansion of the program on the poor.”²³ In my view the main contribution of the paper is that it takes account of both targeting errors—inclusion and exclusion—and nontargeting leakages in estimating the share of expenditures reaching the poor. Both sources of funds diversion (away from the poor) are well acknowledged in the literature, but very rarely do papers combine both. This paper shows how important it is to look at the nontargeting leakages combined with the targeting leakages in order to understand the extent to which government expenditures are reaching the poor. This I think is the primary contribution.

In order to estimate the share that is reaching the poor, the authors decompose the subsidy into four components. One is the excess cost of State agencies relative to presumably what would have been cost of distributions by a more efficient private sector, illegal diversion and the rest, which is either subsidy transferred to the nonpoor or subsidy transferred to the poor. Their central finding is that in both countries participation rates by the poor are low and households, poor or not, do not receive a large share of the subsidies. The findings suggesting that excess cost plus illegal diversion absorb 65 percent of expenditures in the Philippines and 71 percent in India are indeed startling.

I have three main comments on the method. First, what does the percolation index measure? It is estimated as product of the share of the subsidy received by the poor with the share of the poor who receive the subsidy. When the index takes a value of one, most of the expenditures reach the poor and they reach a large percentage of the poor. If the index takes the value zero, the poor receive very little benefit from the program. This would only capture the percolation of a marginal expansion of expenditures on the poor, if the share of the poor in the incremental subsidy would be the same as what is observed on average, i.e., the marginal share is equal to the average share. This, a priori, is not a harmless assumption. For example, a paper by Peter Lanjouw and Martin Ravallion that estimates the marginal incidence of selected antipoverty programs in India concludes that average participation rates are not a reliable guide to how the scaling up of a program would affect participation by the poor. They use interregional or interstate differences in program scale to infer how the composition of participation between poor and nonpoor varies across, and thereby estimate marginal incidence. It would

23. I have quibbles with both terms “impact” and “marginal.” I prefer to not use the term impact because this is not the traditional sense in which we think of impact on welfare or impact on final outcomes of interest. But it is still a useful summary measure of how much of the expenditures are reaching the poor.

be worth following a similar approach in this case as well. If an assumption of homogeneity is not rejected, I would have more confidence in the results. This is in the nature of quibbles. Even so, the percolation index proposed in this paper is still useful as a summary measure of the average percolation of expenditures to the poor.

The second main comment I have is on the calculation of excess costs. Excess costs are measured as the total supply of grain distributed by the governments (offtake) valued at the difference between the economic cost and the market price paid by low-income households. The implicit assumption that is being made is that the observed market price captures well the counterfactual: what it would have cost the government to procure and distribute the grain if it were as efficient as the private sector. I'd like to note a few issues related to this.

First, there is bound to be excess cost in government acquisition and distribution given the way the system works in India. In some areas (not all), the system involves purchase of grain by the government, carting it out of rural areas and then carting it back to rural areas. Some dead weight loss is to be expected and unless the system is reformed to have a much more decentralized scheme for procurement and distribution, it is hard to avoid it entirely.

Second, and more directly pertinent to the estimation in this paper, the question I have is whether the average unit value paid by BPL households (and presumably what is being measured is for non-PDS grain only) *nation-wide* is an accurate measure of the price that FCI or some other State agency would pay if they were more efficient. It is not obvious to me that that is necessarily the case. There will be general equilibrium effects of FCI intervention on retail prices and it is worth thinking about whether FCI, being such an important player in the market, is propping up or depressing retail prices. What we need to get at is the counterfactual: What would be the price if FCI operated more efficiently? Second, on the same topic, as a simple check, it may be worth comparing the unit values of urban and rural areas within each state where one could think of the difference between the urban and rural retail price as a measure of the private sector's cost of moving grain. How does that compare to the reported estimates of economic costs? Also in case data is available, it would be interesting to do this calculation state-wise and separately for urban and rural areas. I am pretty sure you will still get very high levels of excess costs, but some fine-tuning of the methodology would inspire more confidence.

My final point main comment is: Where do we go from here? I agree with the view that given the contest between an untested system (cash transfers) and a tried system (in-kind transfers) that has failed in all but a handful of

regions, there is a need for a policy framework that allows for experimentation, learning, and adjustment. I completely agree with that. But I would like the authors to try to go a bit further with the data at hand.

What do we know? One, several studies show that targeting can work reasonably well at the tails. You can do a reasonably good job excluding, say, the richest 25 percent, and with some (less) confidence include the bottom 15 percent. The middle is a gray area and it is bound to have errors in design and, not to mention, in practice. It is very, very difficult to design a targeting system that is going to do a reasonable job in the middle of the distribution. So we are going to live with targeting errors. State-level experiences which the authors cite suggest that to significantly enhance participation by the poor, a near-universal program (I am not saying whether it is cash or in kind), is the way to go. What about the share of subsidy going to the poor? The authors claim that “enlarging the number of eligible households will increase participation rates” but “perhaps decrease the share of the poor in food subsidy expenditures.” I think this question needs to be examined more closely. Let us focus on a few states where the number of eligible households has been increased by states like Tamil Nadu, Himachal Pradesh, Andhra Pradesh, and Chhattisgarh to see whether this is the case or not. Finally, there is the question of what is it that we are trying to achieve and here the authors do not actually lay out the arguments. I would like to see them laid out. Is it about income support to the poor? If yes, there is a case for cash. Is it about food security, and if so, is that possible with cash transfers? Is it about price stability? If yes, what does that imply about how offtake is to be managed if transfers are to be made in cash? These are some questions. At least the questions should be laid out and some thinking on how to evaluate those options, I think, would be desirable. Thanks.

General Discussion

Shubhashish Gangopadhyay (session chair) opened the discussion by reiterating the big question about the policy implications of the paper’s results. He also had a query about the paper’s finding that the poor who have APL cards had a lower participation rate than the poor with BPL cards, and whether this had something to do with the NSS data.

Bharat Ramaswami noted that the paper was written to provide evidence to inform any policy debate, evidence that was badly missing. For example, much of the debate in India on universal versus targeted transfers or cash versus in-kind transfers made no reference to the efficiency of the PDS. This debate did not recognize that any reasonably comprehensive program

would have to deal with large targeting errors. The paper's finding that 65 to 70 percent of resources were wasted even before targeting errors suggested the massive room available to increase participation rates by adopting more generous eligibility criteria and yet becoming more efficient if the pre-targeting waste could be reduced.

The question of which was more efficient—cash or kind—was a large topic and taking it on would have reduced the focus of the paper on measuring the wastage in the existing system. He referred participants to a May 2011 *Economic and Political Weekly* (EPW) paper by Kotwal, Murugkar, and Ramaswami that dealt with this topic in a much greater detail.

Referring to Rinku Murgai's comment on the marginal equaling the average, he agreed with her. But he noted that the Lanjouw paper's treatment of marginal was very different from the way this paper was considering marginal to be very, very small changes. Looking at regional variation as done in the Lanjouw paper need not be marginal at all. He agreed that getting to the counterfactual on what market prices to compare for estimating excess costs was not easy. The paper clearly had partial equilibrium estimates. One would have to think of the counterfactual first in the absence of any intervention at all, and then a counterfactual in the absence of FCI intervention, since the two could be different. These problems would have to be dealt with even with a computable general equilibrium (CGE) approach. Ramaswami felt that most often the quantum of the actual subsidy was slender, so doing a general equilibrium analysis may not change it that much.

Shikha Jha responded to Surjit Bhalla's question on whether the Philippines had an agency like the FCI by noting that the NFA was similar to the FCI. The only difference was that it imported grain and had the monopoly to do so. The NFA operated a buffer-stock scheme and sold rice at 10 percent lower than market price to consumers and about 10 percent higher than market price to producers. It held about 30 days of stock for price stabilization and about 15 days of stock for emergency use. It procured less than 2 percent of its total requirement domestically because Philippines was import dependent for rice.

On the Chair's query about lower participation by the poor who had APL cards, Shikha Jha responded by noting that this may have to do with the higher prices that APL have to pay. Bharat Ramaswami noted that APL allocations also depended more on the discretion of the central government and the availability of grain.

Indira Rajaraman asked the question of where we go from here given the important findings of the paper. The PDS is not the only food security program in India. There are several price support schemes; there is MGNREGA, which could be seen as a food security scheme that people

self-select into by their willingness to do manual work, the mid-day meal scheme, and the Integrated Child Development Services (ICDS). Her plea was to consider these schemes together and then explore what could be done to rationalize them. She felt that because it is self-targeting, MGNREGA could be the nucleus around which India could build food security. Then we would need to see who is vulnerable but cannot self-select because they are either too old, disabled or geographically scattered, and deal with these special situations. She also made the point that if the FCI is to be liquidated, there will have to be a strategy that takes in account the prime land that it owns in many cities and how the proceeds from that land can be helpful in facilitating any exit scheme.

Pradeep Mehta emphasized that PDS and MGNREGA were part of a bigger process of patronage at the grassroots level and this would make finding political solutions extremely difficult. He felt that there was an implicit consensus among political parties not to interfere with the PDS.

Dilip Mookherjee asked about the market prices the paper had used to assess excess distribution costs. Food was procured in one rural area and then moved around the country, and presumably there was a lot of regional variation in prices. He also raised the issue, which he did not see discussed much in the Indian context, of the impact of the PDS on welfare dependence, on mobility, and on the incentives of the poor to escape poverty. How does India's transfer system, somewhere in between unconditional cash transfers and in-kind transfers, impact the incentives for upward mobility? He also noted that though the participation rates looked quite different between APL and BPL, the income transfer estimate was much larger for the nonpoor than for the poor.

T.N. Srinivasan argued that India's many food-related transfer schemes had different objectives. To take all these into account, it was important to do what the authors had done some years back in looking at foodgrain prices in India, i.e., to have a well-specified general equilibrium model that focused also on trade policy issues that could be important for food distribution. He urged for a more detailed general equilibrium analysis that included foodgrain markets.

Govinda Rao noted that in the Philippines food was being imported at international market prices and then distributed locally, whereas in India there were significant additional distortions and related costs that crept in because the government was setting the domestic procurement price, including externalities such as environmental costs. He was also unsure how the paper adjusted for the underestimation of consumption that the NSS data

is typically blamed for, unless the paper assumed that the NSS consumer expenditure data is correct.

Ulrich Bartch drew attention to the large economic costs of the PDS because of the many distortions it creates in agriculture. The paper's startling findings would look even more startling if we took into account the costs, e.g., of the distorted supply response and the decline in agricultural productivity because farmers are producing rice in areas not suited for rice, as a result of the government's minimum support price for procuring PDS grain.

Ashok Lahiri wondered why grain could not be procured closer to consumption centers through standard procurement rules that all governments follow. The tenders could, of course, come from all over. Why must the government procure grain only where it is produced and then take the trouble of getting the FCI to transport it to consumption centers? He also wondered why the responsibility for targeting and distribution could not be given to the states, with the Center simply giving them the money.

Bharat Ramaswami responded to the question of why income transfers to the nonpoor were larger while their participation rate was lower. He explained that in their paper the poor were defined using the official poverty line, but the participation rates came from separate data on those who had BPL or APL cards. Since there were many BPL cardholders who were not poor, a lot of the income transfer could be happening to them. To the question of which market price to use for assessing the excess costs of PDS, he felt there was no single, clean answer. In wheat where there was not much quality variation, the issue of which price to use was less important, but in rice it was important. On the question about NSS consumption expenditure data, he noted that people working on the issue have suggested that if all food grains are taken together, the NSS matches the data on availability coming from the supply side.

Surjit Bhalla noted that the estimated cost of illegal diversion in both the Philippines and India was identical at 43 percent. The estimated excess cost of public as compared to private distribution was also broadly similar, at 22 percent in the Philippines and 28 percent in India. But the big difference came in the income transfer to the poor, 10 percent in India and 21 percent in the Philippines, and in the income transfer to the nonpoor, 19 percent in India and 14 percent in the Philippines. The Indian percolation index was approximately half to 60 percent of what the percolation index was in the Philippines.

Rajesh Chadha pointed to the many hidden costs in the public procurement and distribution system in India. For example, misplaced regulation in rice milling in Punjab state thwarted competition among millers, as a

recent NCAER survey showed. Millers are required to sell 75 percent of milled non-basmati rice at a predetermined price as a levy to FCI. The only alternative is to mill paddy allotted to them by FCI at fixed rates of milling. Millers respond by mixing in the poorest quality rice or rice fragments into what they mill.

Pratap Bhanu Mehta wanted to ask what the impact of the diversion of grain and its reselling was on market prices. Given the large quantities that the paper estimated are diverted, and then presumably resold, what do we know about the impact of this diversion on market pricing?

Anil Sharma observed that it may be too early to write the obituary of targeting in India since India had mostly run a universal PDS for 35 years and started targeting only some 10 or 11 years ago. The unique biometric id *Aadhaar* could help address some of the weaknesses such as duplication and bogus cards.

Pradeep Mehta wanted to remind everyone that Prime Minister Rajiv Gandhi had said many years ago that only 15 paise of every rupee the government spent on the poor actually reached the poor, so the estimates in his paper should not have come as a surprise. Disagreeing with Surjit Bhalla, he felt it would be suicidal to hand over the PDS to panchayats. That would only drive the corruption down lower.

Surjit Bhalla replied that continuing to oppose devolution to panchayats missed out on the changing role of technology, civil society, and the media. These changes would increasingly make it very difficult for even panchayats to do the wrong thing and get away with it.

Indira Rajaraman noted that if we accept MGNREGA as the core of a future food security program and add to that an additional program for those who are vulnerable and cannot self-select, then panchayats are especially good at identifying the vulnerable through the Gram Sabha.

Pradeep Mehta clarified that handing over responsibility for regulating PDS shops to panchayats would be more effective than the current practice of asking the district supply officer to do it. But it would not solve the problem. Though it had not come up, he noted that the margin on food grains distributed through the PDS system was so low that unless the owner cheated, he could not make any money.

Shubhashis Gangopadhyay ended the session with his comment that he found it strange that they had been talking about targeting when almost in the same breath others are talking about the legislation that treated food as a basic right. He hoped that this fundamental issue could be discussed in the Roundtable on Subsidies scheduled for the following day at the IPF.

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