



Pilferage from opaque food subsidy programs: Theory and evidence



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ABSTRACT

Theft rates from subsidized food programs vary greatly and strongly influence program efficiency. Unfortunately, the determinants of these variations remain understudied because the agencies that run these programs seldom publicize the allocations of subsidized food to local markets. We develop a theoretical model of pilferage which predicts that: (i) pilferage from opaque programs is likely to rise more than proportionately with per capita food allocations; (ii) pilferage of inferior goods may be lower in poorer communities; (iii) pilferage rates need not rise as price subsidies are increased; and (iv) pilferage may rise as the relative quality of subsidized food is reduced. A comprehensive literature review and new estimates of pilferage across regions of the Philippines validates these predictions. Our finding, that around 48% of the subsidized rice went missing, is robust to new tests for sampling and recall error. Our policy discussion encourages geographic over administrative targeting, greater transparency in food allocations, and the use of realistic quotas.

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Introduction

Many countries scaled up food subsidy schemes in response to rapid run-ups in food prices in 2008 (Demeke et al., 2009), and some countries (e.g., India) are considering large long-term expansions of existing programs. Temporary program expansions may become increasingly important to protect the poor as food prices become more volatile (Timmer, 2010). Unfortunately, food subsidy programs are often beset with high rates of pilferage because it is more profitable to sell the subsidized product illegally at market prices than at subsidized prices. These high rates of theft increase the difficulty and cost of meeting food security goals (Ahluwalia, 1993; Olken, 2006). Interestingly, while pilferage rates tend to be quite high, they are also extremely variable (e.g., Himanshu and Sen, 2011).

The effects of changes to program parameters (including program scale, price subsidy levels, the quality of subsidized food and the incomes of targeted populations) on program outcomes are therefore likely to depend upon how they alter pilferage rates. Unfortunately, statistical analysis of these relationships has been limited, in part because such programs are usually opaque – governments seldom publish disaggregated data on the amounts

of food allocated for distribution in various local markets.¹ While institutional field studies offer tremendous insight into how this corruption works (e.g., Ahmed, 1992; Dreze and Khera, 2010; Khera, 2011a), there appears to have been no formal theoretical analysis of these relationships either.

This study makes some progress in filling these gaps. It develops a formal theoretical model of pilferage that captures the key institutional safeguards against theft and analyzes the effects of program opacity on the efficacy of those safeguards. One result, familiar from the literature on the theft of public funds (Reinikka and Svensson, 2004a), is that the amount of subsidized food allocated for delivery and the amount actually delivered to consumers will have a low correlation in an opaque program. This is because vigilance and public action at the community level are required to ensure service delivery (Dreze and Sen, 1989), but are thwarted by systemic opacity. It follows that when a large increase in program inputs is poorly publicized, a large proportion of this additional food is likely to be pilfered. In other words, the model predicts a high *marginal pilferage rate*, and the possibility of sharply diminishing returns to program

¹ Many food distribution systems fit this description. For example, most Indian states only disclose the total amount of food they obtained from the central government, not its allocation among local markets. Many consumers in India and Indonesia also do not receive their full entitlements of subsidized food (Khera, 2011a; Olken, 2006), and allocations to local markets often do not cover these entitlements, complicating the detection of theft by consumers. Our institutional review confirms the opacity of the Philippines distribution program.

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Table 1
Previous estimates of missing subsidized staples.

Study	Country	Product	Percent pilfered
Alderman (1988)	Pakistan	Wheat	69%
Rajagopalan (1989)	India	Sugar	44–62% rural 10–16% urban
Howes and Jha (1992)	India	Food-grains	35% – National Varies by state
Ahluwalia (1993)	India	Wheat	32%
		Rice	31%
		Sugar	34%
		Edible oils	51%
Jayne et al. (2001)	Ethiopia	Food-aid	18% – Upper bound
Ahmed et al. (2001)	Egypt	Baladi bread, wheat flour, sugar, edible oils	2–47%. Estimate varies by commodity and location
Murgai and Zaidi (2005)	Bangladesh	Food-grains	10–65%. Estimate varies by program
Planning Commission (2005)	India	Food-grains	16–82%. Varies by state
Olken (2006)	Indonesia	Rice	18%. Lower bound
Jha and Ramaswami (2011)	India	Foodgrains	37–54% by year
Himanshu and Sen (2011)	India	Foodgrains, rice, wheat	Varies by year, state and product
Khera (2011b)	India	Foodgrains, rice, wheat	Varies by year, state and product

scale in opaque systems.² This underscores the urgency of transparency in an era of food price volatility.

Our model also suggests that, in contrast to findings regarding the embezzlement of public funds, *less* subsidized food may be stolen from poorer communities. This is because subsidized food is often an inferior good (Ahluwalia, 1993; Reyes et al., 2009), so that poorer communities will have more consumers with incentives to combat corruption. Another result is that reducing the depth of the price subsidy has ambiguous effects on theft because while this reduces the benefits of theft, it also reduces community vigilance. Finally, our model predicts that, other things equal (including subsidized and unsubsidized prices), a larger quality shortfall between subsidized and unsubsidized food is likely to increase corruption. These results suggest that a pure arbitrage based model of black-marketing is too simplistic, and they resonate with previous studies that emphasize the importance of effective civil monitoring to ensure the proper functioning of social insurance programs (Ahrend, 2002; Asian Development Bank, 2013; Francken et al., 2005).

We also apply the model to a case study of a rice subsidy program in the Philippines, which is well suited to studying these issues because (i) the program was opaque to consumers, (ii) it was governed by a single organization nationwide, and (iii) per capita incomes and subsidized food allocations – two of our three key independent variables – varied significantly across regions. The paper develops a small dataset of theft rates across regions of the Philippines' and uses it to test the theoretical predictions.

The paper proceeds as follows: Following a brief literature review, we develop our theoretical model. We then describe the Philippines subsidy program and its anticorruption procedures. This is followed by a description of our data, our estimates of pilferage rates and an examination of the testable implications of the model. The final section discusses policy implications. Tests of the robustness of our estimates of pilferage, most of which we have not seen in the literature, are provided in Appendix A.

Literature review

The empirical literature on subsidized food theft is small, mainly because of a lack of survey data for estimating subsidized food deliveries to consumers and of official figures on subsidized allocations for delivery. Most of the available studies only provide a single aggregate estimate of theft (see Table 1), and are therefore not useful for considering the comparative statics of theft.

Results from remaining studies appear consistent with our model's predictions, but are not entirely conclusive. Correlations

between local incomes and pilferage were negative but weak in Indonesia (Olken, 2006), while the relationship between the subsidy level and pilferage rates across Indian states was fragile to changes in control variables (Ahluwalia, 1993). Our theoretical model similarly cannot sign either relationship.

While we have found no previous attempt to estimate marginal pilferage rates, back of the envelope calculations based on existing studies are intriguing. Jha and Ramaswami (2011) estimate that when India increased foodgrain supply to its PDS from 1.61 to 2.27 kg/(person-month) between the 1999/2000 and 2004/2005 survey years, consumption of subsidized foodgrains only increased from 1.01 to 1.03 kg/(person-month). Khera's (2011b) findings confirm that disappearance of subsidized rice and wheat increased dramatically during this time in most states. Himanshu and Sen's (2011) calculations show that foodgrain inputs doubled between 1993/1994 and 2004/2005 while output increased by only 2%.

Although these inter-temporal comparisons might suggest high marginal pilferage rates, they suffer from serious *ceteris paribus* violations, particularly due to price changes.³ Comparisons across Indian states could yield even less meaningful estimates because each state manages its own distribution system and has flexibility to set operating procedures. Olken's Indonesian theft data are noisy underestimates derived under the assumption that households receiving subsidized rice received their entire quota. Other than these Indian and Indonesian studies, we have found no previous studies that were able to shed light on geographic or temporal variation in the theft of subsidized food. In this context, we provide what appear to be the first point estimates of theft from several regions under the same program.

Regarding transparency and institutional design, there appears to be unanimity (e.g., Dreze and Khera, 2010; Himanshu and Sen, 2011; Khera, 2011b) that those Indian states that took transparency and voice seriously had lower pilferage rates. These authors argue that publishing movements of subsidized food, improving complaint processes, de-privatizing distribution, and making subsidies universal (rather than targeted) increase essential political support for management. These informed judgments and case studies notwithstanding, the only usable comparisons of well measured pilferage rates across transparency regimes that we could find come from Egypt (Ahmed et al., 2001), which employed four distinct subsidy programs, covering *baladi* wheat flour, *baladi* bread, sugar, and cooking oil. Mehta and Jha (2012, p. 12) provide a comparative analysis of pilferage from these programs. They

³ Indeed, findings from Himanshu and Sen (2011) show that during between 2004/2005 and 2007/2008, when food prices rose dramatically, the rice pilferage rate fell as the rice program was expanded. Disentangling the effects of program size from those of market conditions will be a challenge when prices rise rapidly. Compared to this later period, prices between 1993 and 2004 were stable.

² In this paper a program's "scale" is the amount of food allocated per beneficiary, not the number of beneficiaries.

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