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How Consumer Price Subsidies affect Nutrition

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Summary. — We study the effect of an exogenous increase in food grain subsidy from a program targeting the poor in rural India and find that the increase in income resulting from the subsidy increased consumption of the subsidized grains and certain more expensive sources of nutrition, lowered consumption of coarse grains, the cheaper, yet, unsubsidized staple food, and increased expenditures on nonfood items but had no effect on nutrition in poor households. Estimates of the price effect of the subsidy on nutrition are also negligible; the price subsidy increased consumption of wheat and rice and lowered consumption of coarse grains.

Key words — price subsidies, nutrition, consumption, poverty

1. INTRODUCTION

There is a longstanding debate on the extent to which nutrition among the poor in developing countries improves with income. Conventional wisdom is that higher income would solve the problem of undernourishment. Empirical studies, however, provide mixed evidence with calorie-income elasticities ranging from negligible to high.[1] The evidence is also mixed from research on the effect of food price subsidy on nutrition.[2] A key concern with many of these studies is that income and price variation are not exogenous. Because families that are poor are more likely to seek and receive subsidies and are also likely to have lower levels of nutrition, estimates based on a simple correlation between subsidy amount and nutrition are likely to be biased.[3]

How food price subsidies impact nutrition is important because of the high incidence of undernourishment in developing countries and because of the high political and public support that food price subsidy programs enjoy despite widespread evidence that these programs are afflicted with corruption and poor targeting. In 2014, there were 805 million chronically undernourished[4] persons in the world (FAO & IFAD & WFP, 2014). India, home to 24% of the world's undernourished, passed the National Food Security Act in 2011 that promises to provide highly subsidized food to 75% of rural households and 50% of urban households (National Advisory Council, 2013). If food price subsidies do not influence nutrition, such a policy would increase allocation of resources to a program that is widely documented to be inflicted with poor targeting, inefficiency, and corruption (Chaudhuri & Somanathan, 2011; Comptroller and Auditor General of India, 2000).

In this paper, we bridge this knowledge gap by studying the effect of a food price subsidy program in India called the Targeted Public Distribution System (TPDS) on per capita energy, protein, fat intake, and food consumption. Specifically, we investigate the effect of an exogenous increase in food price subsidy to poor families resulting from the introduction in 1997 and expansion in 2002 of TPDS. The Indian government issued ration cards, called BPL cards, to households with incomes below the official poverty threshold, which could be used to purchase at approximately two thirds of the market price 10 kg of rice or wheat per household per month – an amount that was raised to 35 kg in 2002.[5] We use the probability of BPL card ownership as an instrumental variable to predict the food price subsidy of households and study how the increase in predicted food price subsidy after the TPDS expansion affected per capita calorie, protein and fat intake, total food consumption, and consumption of specific food items, subsidized as well nonsubsidized, in poor families in rural India. The latter allows us to study changes in consumption patterns underlying the changes in nutrition.

Wheat and rice price subsidies release funds that families can use, depending on their tastes, for buying: (i) higher quantities of subsidized food items, (ii) higher quantities of nonsubsidized food, and (iii) nonfood items. The increase in income resulting from subsidies may also lower consumption of coarse grains that are cheaper, but generally considered as inferior (taste-wise) substitutes for wheat and rice. As we illustrate with a simple model it is unclear if TPDS would raise or lower nutrition; indeed, income increase resulting from the subsidy may have a negligible or even negative effect on nutrition if substitution from cheap grains to expensive food or nonfood items is large.

Our objective is to study both the effect of the price subsidy (% price discount) and of the increase in income resulting from the subsidy program on nutrition. To accomplish that we take advantage of divergent consumption patterns across districts to stratify the sample covered by our study into two groups: districts where wheat and rice are the staple food and districts where coarse grains are the staple food. In districts where wheat and rice are the staple food, the average monthly household consumption of wheat and rice in the pre-TPDS period is 35 kg, the PDS purchase limit, or higher. In these districts, TPDS will have a purely income effect on households receiving the subsidy. In 15 districts, however, the average consumption of wheat and rice in the pre-TPDS period is 20 kg or less. These are districts where coarse grains are the staple food, but the price subsidy is provided for wheat and rice. As we illustrate below, the marginal price of wheat and rice for most households receiving the subsidy in these districts would be the subsidized price. In the empirical analysis, we first estimate the effect of total subsidy amount in 66 districts where wheat and rice are the main staple and the average household consumption is 35 kg or higher in the pre-TPDS period, followed by an analysis of the effect of price subsidy on poor households in the 15 districts where the average combined consumption of

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wheat and rice in the pre-TPDS period is 20 kg or less. In the latter analysis, we specifically estimate the effect of the price subsidy on nutrition and consumption patterns, while the former provides an estimate of the effect of an increase in income resulting from TPDS on nutrition and consumption patterns.

Our analysis follows Kochar (2005), who applies the initial changes in the Targeted Public Distribution System and finds that food price subsidy had a modestly positive effect on calorie intake. A limitation of her research is low take up rate as her empirical analysis is restricted to nine states in India where the PDS off-take is modest and leakages high (Jensen & Miller, 2011; Khera, 2011; Planning Commission, 2005).[6] More importantly, Kochar's study covers the initial period of the TPDS (July 1999–June 2000) during which most states/union territories had not completed identification of the poor who would be eligible for TPDS (Umali-Deininger, Sur, & Deininger, 2005).[7]

We focus on states often described as PDS "functioning or reviving" states, with relatively high take up and cover a post-expansion period when BPL cards had been issued and the TPDS was fully implemented. Further, our study excludes states that had a targeted PDS prior to 1999. We use data from three cross sections of the National Sample Survey for 1993–94 (50th round), 1999–2000 (55th round) and 2004–05 (61st round) that allow us to control for long-term trends in nutrition and estimate the effect of food price subsidy and total subsidy amount on consumption patterns and nutrition.

2. A SIMPLE THEORETICAL MODEL

Figure 1 presents a simple model to illustrate how a food price subsidy affects consumers and provides the intuition behind our empirical specification. Let the utility function depend on two goods: x and y. Assume that both goods have positive income elasticities. The price of y is fixed at \$1 and income at I. In period t, the price of x is p and the budget constraint is depicted by AB, specified as: $I = y + px$, along which the consumer allocates income between the two goods. In period $t + 1$, the government allows a food price subsidy: the consumer can buy up to a maximum amount x_0 at price cp (where $c < 1$). ACD is the new budget constraint, specified as:

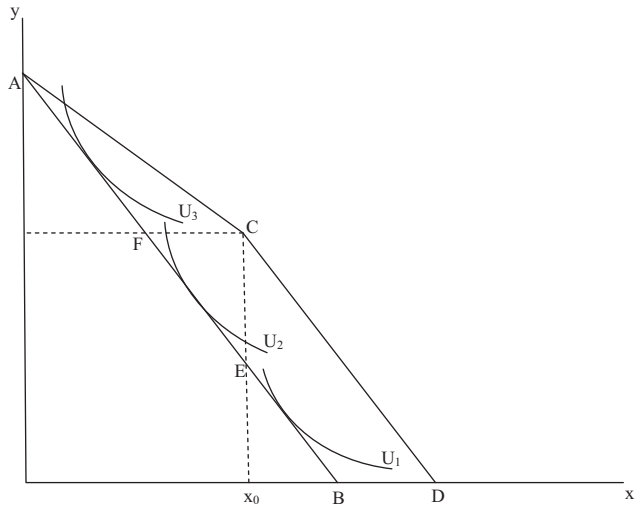

Figure 1. *Food price subsidy.*

$$I = y + cpx_0 + p(x - x_0), \text{ or}$$

$$I + p(1 - c)x_0 = y + px$$

At point C on AC, $x = x_0$ and $y = I - cpx_0$ and at point F on AB, $y = I - cpx_0$ and $x = cx_0$.

Figure 1 also presents the indifference curves of three individuals in period t. Consumer 1 is located to the right of x_0, consuming more than x_0 in the initial period. With the subsidy program, consumer 1 will be on the CD portion of the budget constraint and the subsidy program will have a pure income effect on consumer 1. Consumer 2, who is on segment FE of the budget constraint in the initial period, could have a new equilibrium at either the AC or CD segment of the new constraint. If the new equilibrium falls on segment AC, the marginal price for consumer 2 will be the subsidized price. If, on the other hand, the new equilibrium is on the CD segment of the budget constraint, consumer 2's marginal price will be the market price. Consumer 3, who is on segment AF of the budget constraint before the price subsidy is introduced, must end up at a point on AC. Thus, the marginal price for individuals who consumed less than cx_0 in the initial period will be the subsidized price.[8]

Two inferences can be drawn from this simple illustration. One, price subsidy on wheat and rice will increase their combined consumption for all three consumers. Two, in districts where wheat/rice are the staple food and their combined average household consumption is 35 kg or more in the pre-TPDS period (i.e., consumer 1 in the above example), price subsidy on wheat and rice will have a purely income effect. In districts where coarse grains are the staple food and the average household consumption is less than 23 kg [35 * (1 – 0.33) = 23, assuming that the subsidy is one third the market price] in the pre-TPDS period (consumer 3 in the above example), most households will face the subsidized price of wheat and rice in the TPDS period. Our empirical analysis is guided by these inferences. Specifically, for households in districts with the average combined wheat and rice consumption of 35 kg in the pre-intervention period, we estimate the effect of subsidy value (increase in income) on nutrition and consumption patterns. For households in districts with the average combined wheat and rice consumption of 20 kg or less, we estimate the effect of the price subsidy (% increase in price) on nutrition and consumption patterns.

What would be the effect of TPDS on nutrition? Consider the case of high wheat- and rice-consuming districts where food price subsidy will have a purely income effect. By lowering the price of subsidized food items, wheat and rice subsidies will release funds that families can use, depending on their tastes, for buying: (i) higher quantities of subsidized food items, (ii) higher quantities of nonsubsidized food, and (iii) nonfood items. Increase in income may also lower consumption of coarse grains that are cheaper, but generally considered inferior (taste-wise) substitutes for wheat and rice. Overall, it is unclear if TPDS would raise or lower nutrition; indeed, income increase resulting from the subsidy may have a negligible or even negative effect on nutrition if substitution from cheap grains to expensive food or nonfood items is large.

Now consider districts where the staple food is coarse grains and the average monthly household consumption of wheat and rice is relatively low (say 20 kg or less). Coarse grains are cheaper sources of nutrition, but are not subsidized. In these districts, wheat and rice price subsidy will largely have a substitution effect. The subsidy will lower the relative price of wheat and rice (compared to coarse grains) raising their consumption and lowering the consumption of coarse grains.