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ABSTRACT

We study the effect on nutrition of an exogenous increase in food price subsidy from a targeted subsidy program in India. Households with incomes below the federal poverty threshold were issued ration cards to buy wheat and rice at half the market price. We use probability of ration card ownership as an instrumental variable to predict household food price subsidy. Estimates suggest that the predicted price subsidy had a negligible to negative effect on calorie intake; it increased calorie intake from wheat and rice, but lowered calorie intake from coarse grains that are less expensive substitutes of wheat and rice, but have fewer non-nutritional attributes (such as taste).

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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: whereas some studies have estimated high elasticities of calorie consumption to income (Ravallion, 1990; Strauss and Thomas, 1989; Subramanian and Deaton, 1996), others have found these elasticities to be close to zero (Behrman and Deolalikar, 1987; Bouis and Haddad, 1992; Bouis, 1994).

The evidence is mixed from research on the effect of food price subsidy on nutrition.[1] Kochar (2005) estimates a modestly positive effect on calorie intake from a food price subsidy program in India. In a randomized experiment conducted in two Chinese provinces, Jensen and Miller (2011), however, do not find any overall improvement in nutrition on account of food price subsidy. Their findings are somewhat different across the two provinces. In Hunan, food price subsidy lowers calorie in-take and in Gansu it has a modestly positive, often statistically insignificant, effect. In Hunan, food price subsidy also induces substitution away from the subsidized staple food towards foods that are expensive sources of nutrition. Shimokawa (2010), on the other hand, finds that response to food price subsidies in China is asymmetric: introduction of subsidies increases nutrition intake, but their disruption has an insignificant effect. A limitation of the previous research is that the change in price subsidy being studied is relatively small.

[1] There is a large literature on the nutritional impact of food prices in developing countries with mixed results (Ecker and Qaim, 2011, Behrman et al., 1988, Guo et al., 1999, Shimokawa, 2010). A key concern with many of these studies is that price variation is not exogenous.

In this paper, we study the effect of an exogenous increase in food price subsidy to poor families resulting from the introduction in 1997 and expansion in 2002 of a targeted food price subsidy program in India called the Targeted Public Distribution System (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 half the market price 10 kg of rice or wheat per household per month, an amount that was raised to 35 kg in 2002. 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 resulting from the expansion of TPDS affected the nutritional intake and consumption patterns of poor families in rural India.

Our study differs from Jensen and Miller (2011) in two substantive ways. The food price subsidy in Jensen and Miller constituted about 8 to 25% of the market price; the subsidy under TPDS is approximately 50% of the market price. Arguably, if food subsidy increased nutritional intake, it would be easier to detect the effect of a larger subsidy program. We also have the advantage of a considerably larger sample to glean small sized effects: our sample comprises of 43,484 households compared to 1293 households in the Jensen and Miller's study.

Our analysis follows Kochar (2005), who applies the initial changes in the Targeted Public Distribution System. A criticism of her research is low take up rate: Kochar's analysis is restricted to 9 states in India where the PDS off-take is modest and leakages[2] high (Jensen and Miller, 2011; Planning Commission, 2005; Khera, 2011). More importantly, Kochar covers the initial period of the TPDS (July 1999- June 2000) during which the maximum PDS food grain quantity was a modest 10 kg per household per month and most states/union territories had not

[2] Studies find large scale grain divergence with ration shop owners selling PDS grains in the open market.

completed identifying the poor who would be eligible for TPDS (Umali-Deininger et al., 2005). Further, she focuses on wheat subsidy. Detailed evaluations show that the PDS has been less effective in wheat consuming states than in rice consuming states (Khera, 2011).

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 investigate the effect of food price subsidy (wheat and rice) on nutritional outcomes as well as consumption patterns. The latter allows us to examine changes in consumption patterns underlying the changes in nutritional outcomes. We use data from three rounds of the National Sample Survey for 1993-1994 (50^{th} round), 1999-2000 (55^{th} round) and 2004-2005 (61^{st} round) that allow us to control for long-term trends in nutrition and estimate the effect of food price subsidy on consumption patterns and nutrition.

Our study has policy relevance for developing countries that spend large sums on food price subsidies to address undernourishment, which continues to be critical in many countries of South Asia and sub-Saharan Africa. In 2012, according to the UN Food and Agriculture Organization, there were 780 million chronically undernourished persons in the world. Food price subsidy programs have high political and public support compared to unconditional cash transfer programs even though these programs are often afflicted with corruption and poor targeting. To eradicate undernourishment, the Indian National Food Security Bill promises to provide highly subsidized food to 75% of rural households and 50% of urban households (National Advisory Council, 2011). The cost of India's PDS, currently at 1% of the GDP, will rise further if the National Food Security Program is implemented nationwide. If food price subsidy does 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 (Comptroller and Auditor General of India, 2000; Chaudhuri and Somanathan, 2011).

Food Price Subsidy and the Targeted Public Distribution System

Food price subsidies influence family budgets and consumption patterns in a number of ways. By lowering the price of subsidized food items, these subsidies release funds that families can use, depending on their tastes and preferences, for buying: (i) higher quantities of subsidized food items, (ii) higher quantities of non-subsidized costlier sources of nutrition (e.g. eggs, meat, milk), and (iii) non-food items. To meet their minimum nutrient requirements, the poor households spend a large proportion of their food budget on staple food because it is less expensive. In India, less expensive grains, namely jowar (sorghum), bajara (pearl millet), maize and ragi (finger millet), considered inferior substitutes of rice and wheat on grounds of non-nutritional attributes, are the staple food in many poor families. These grains are cheaper sources of nutrition, but are not subsidized. Food price subsidy on wheat and rice may induce low-income families to substitute these inferior grains with the subsidized grains or other expensive items of nutrition with non-nutritional attributes such as taste. Thus, it is unclear whether food price subsidy on rice and wheat would raise or lower nutrition; indeed, subsidies may have a negligible or even negative effect on nutrition if substitution from cheap coarse grains to expensive sources of nutrition or non-food items is large.

Jointly operated by the federal and state governments, India's Public Distribution System provides subsidized wheat and rice via a network of around 477,000 fair price shops across the country. To address criticism relating to high operational costs, poor-targeting, and corruption, in 1997, the government replaced the PDS, a universal program, with the Targeted PDS that restricted sale of subsidized food grains to families with incomes below the 1993-1994 poverty threshold fixed by the Federal government (henceforth referred to as BPL households). But the implementation of TPDS could not begin in most states till 2000 due to delays in identification of BPL households and distribution of BPL ration cards (Umali-Deininger et al., 2005).

The initial monthly allocation under TPDS was a modest 10 kg per household, at roughly half the market price, and was raised to 20 kg in April 2000 and to 35 kg in April 2002. In December 2000, a third tier was introduced, under the Antyodaya Anna Yojana (AAY) program that involved a higher subsidy to the poorest of the poor. Three types of cards were issued under the new system: AAY cards to the poorest of the poor, BPL cards to the other poor with incomes below the poverty line, and APL cards to the non-poor. In the initial period of the TPDS, APL families could buy food grains from ration shops at market prices; since April 2002, a modest 10% subsidy is given to certain purchases by APL card holders as well, but allocation to APL families is contingent on availability after meeting the needs of BPL households (Ministry of Consumer Affairs, Food and Public Distribution, 2011).

A number of states have decided to not follow the dual pricing scheme of the federal government. For instance, Tamil Nadu adopted a universal PDS with the AAY covering the entire population. Andhra Pradesh had a targeted program prior to 1997 and continued with it after the federal TPDS was implemented. Since 1992, the state of Orissa had been providing higher food price subsidy in certain tribal areas under the revamped PDS.

State and private evaluations of the TPDS have been mixed. A detailed evaluation report by the government documents that the TPDS remains afflicted with large-scale diversion of grains in many states (Planning Commission, 2005).[3] Umali-Deininger et al. (2005) and Khera

[3] A detailed evaluation of the program showed that nationally only about 57% of the poor households were covered by it and only about 42% of the subsidized grains issued by the central pool reached the poor: about a third of the

(2011), however, document increased grain allocation and off-take in most states after the TPDS expansion.[4] Khera (2011) documents that there are seven large states where the PDS has been functioning well, and in another five states it has 'revived' since TPDS implementation. The focus of our study is six "well-functioning or reviving" states that have implemented the TPDS system, namely: Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Uttaranchal, and Chhattisgarh – for convenience we call them PDS functioning states. States that had dual pricing prior to TPDS, namely Orissa, and four major southern states- Andhra Pradesh, Tamil Nadu, Kerala and Karnataka (all well-functioning states) are excluded from the analysis. Further, we do not include Uttar Pradesh, classified a "reviving' state by Khera, because in 2004-2005, the post policy period covered by our study, the per capita off-take of PDS was less than 500 grams per month in this state.

For comparison, we also study the pre to post-TPDS changes in nutrition patterns in seven states, characterized as languishing states by Khera (2011). These states are: Assam, Bihar, Jharkhand, Punjab, Haryana, Gujarat, and West Bengal. In 1999-2000, the average monthly per capita PDS food grains (rice + wheat) purchased in these states was less than 500 grams and it remained roughly the same in 2004-2005 after the implementation of TPDS.

Data

The study is primarily based on data from three rounds of the National Sample Surveys (NSS): the 50th round conducted in 1993-1994 (Schedule 1.0), the 55th round conducted in 1999-2000 (Schedule 1.0), and the 61st round conducted during 2004-2005 (Schedule 1.0). These are

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budgetary subsidy was siphoned off the supply chain and 21% reached the non-poor households (APL) (Planning Commission, 2005).

[4] Swaminathan and Misra (2001) found that shifting from universal to targeted coverage increased errors of exclusion (excluding poor people) but lowered the errors of inclusion in Maharashtra. But they used 1995-2000 data, thus their study did not cover the post TPDS expansion period.

nationally representative surveys covering between 120,000 to 125,000 households in each round. The last two rounds were conducted about two years before and two years after the expansion of the TPDS, therefore, are appropriate to study its effect on nutrition. In recent decades, there has been a steady decline in calorie intake in India across income quintiles (Deaton and Drèze, 2009). These trends are likely to confound the effect of the TPDS on nutrition. We combine the 1993-1994 NSS data with the two later rounds and include district specific trends to control for the long-term trends in nutrition.

The NSS collects detailed data on expenditures over the past 30 days. Specifically, for the purpose of this analysis, the surveys provide information on the quantities of wheat and rice purchased and the value of their purchases from ration shops as well as in the open market. Following Kochar (2005) and Deaton (1997), district level open market prices of wheat and rice are computed from the NSS household data by dividing the value with the quantity of each item (wheat or rice) purchased from the open market. To minimize measurement error, districts with fewer than 100 observations (households) in any year are dropped from the analysis. Additionally, one district (with 384 observations) is excluded from the 1999-2000 data since a third of its sample in that year reported purchasing PDS wheat and rice at prices that exceeded the district's mean open market price. Overall, our study covers 62 districts in PDS functioning states and 90 districts in PDS languishing states. The 1993-1994 NSS does not provide district identifiers for urban areas.[5] Therefore, all analysis is restricted to rural areas.

In the NSS surveys, expenditures on education, durables, and institutional medical care are for the past 365 days and on other items for the past 30 days. For the analysis we convert all

[5] We are grateful to Anjini Kochar for providing us with documentation on district identifiers for rural households in the 1993-1994 NSS data.

items to expenditures in the past 30 days. Detailed data on food consumption are converted into three nutrient intakes: calories, protein, and fat, using conversion factors from the NSS (National Sample Survey Organization, 1996; National Sample Survey Organization, 2001; National Sample Survey Organization, 2007). The amount of each food item consumed is multiplied by its per unit nutrient content and converted to average daily nutrient intake.

We study the effect of food price subsidy on the following per capita food quantities: quantity of wheat and rice; pulses and pulse products; and edible oil, and expenditure on certain composite food categories that cannot be easily converted into quantity: milk, milk products, eggs, fish and meat; sugar and sugar substitutes; and all other foods. To examine if price subsidy on wheat and rice influences purchases of relatively cheaper or expensive sources of calories, we study two other outcomes. The first outcome is per capita quantity of coarse cereals namely, maize, jowar, ragi, and bajara. It captures cheaper sources of calorie and protein. In our data, in the pre-TPDS expansion period in PDS functioning states, the cost per calorie from the consumption of these coarse cereals is 40% lower than the cost per calorie of non-PDS wheat and rice and 14% less than the cost per calorie of PDS wheat and rice. The second outcome is per capita expenditure on expensive sources of calories and these items are: pulses and pulse products, milk and milk products, edible oil, sugar, eggs, fish and meat. In our data, these items are 155% more expensive sources of calorie than non-PDS wheat and rice.

All expenditures are adjusted for inflation using the Agricultural Laborers Consumer Price Index. To ensure that the analysis is not driven by extreme values, households reporting per capita monthly consumption of more than 30 kilograms of any specific cereal (e.g. wheat, rice, bajara, maize etc.) or more than 30 kilograms of edible oil are dropped from the analysis. Further, households reporting a per capita daily calorie consumption of more than 10,000 and a per capita daily protein consumption of more than 300 grams are dropped from the analysis. Overall, as a result of these exclusions, 133 households are dropped from the analysis from the combined sample of observations from the PDS functioning and languishing states. We also exclude, from the combined sample, 678 households (1.3% of the sample) that report purchasing PDS wheat and rice at prices greater than their districts' average open market price.

Additional adjustments are made in models using outcomes specified in logarithm: we assign a monthly per capita food price subsidy of Rs 0.01 to households that had a subsidy of 0; in models with logarithm of calories consumed (per food item) as outcome, households that consumed 0 calories from coarse cereals; sugar and sugar substitutes; and milk, egg, fish and meat are assigned 0.001 per capita daily calories for each of these food items; and in models with logarithm of per capita quantity of coarse grains as the outcome, households that did not consume coarse cereals are assigned 1 gram in monthly per capita consumption.

All three rounds of the NSS provide detailed data on individual household members, including their age, educational attainment, sex, marital status, current employment status, and relationship with the household head. The NSS also provides information on household characteristics namely: household size, caste, religion, occupation of household head, land ownership, amount of land irrigated, detailed data on ownership of durables, urban-rural residence, district of residence, and state or union territory (UT) of residence. We compute district-level monthly per capita expenditure, open market price of rice, and open market price of wheat by averaging the respective household values in each district.

The 2004-2005 NSS provides data on type of ration card that a household owns: AAY, BPL, APL and no card. Because the new ration cards were not issued in 1993-94 or 1999-2000, we do not have this information for households in these years. We use the 2004-2005 data on card ownership to predict the probability of BPL/AAY card ownership using a rich set of household characteristics that are exogenous to the Targeted Public Distribution System. In our data only 2.4% of the households had an AAY card in 2004-2005. To minimize prediction error, we combine the AAY category with the BPL category. Specifically, we regress whether the household has a BPL/AAY card (binary variable – for convenience, henceforth we call this variable BPL card) on the household head's age (a set of dummy variables indicating age categories: 0-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, and 70 or older), education (categorical variables indicating illiterate; literate with less than primary education; primary education; more than primary but less than secondary; and secondary or higher education), gender, marital status, and occupation, education of other household members (all illiterate; at least one, but not all, literate; all literate), household caste (categorical variables indicating scheduled caste, scheduled tribe, and other castes) and religion (categorical variables indicating Hinduism, Islam, Christianity, Sikhism, Jainism, Buddhism, Zoroastrianism, and other religions), land ownership, household size (categorical variables indicating 1, 2, 3-5, 6-8, and 9 or more household members), whether land is irrigated, ownership of durables, namely radio, TV, bicycles, electric fan, sewing machine, fridge, motor cycle, or car; and district of residence fixed effects. The coefficients from this regression are used to predict the probability of BPL ration card ownership of households in all years.

Estimation Strategy: Food Price Subsidy and TPDS

We begin the analysis by studying the effect of the TPDS on the subsidy received by BPL cardholders, the target of the program. The food price subsidy (S_{ijt}) that household i in district j receives in year t, is computed as the difference in the open market price (P^m_{fjt}) of the food grains (wheat, rice) minus the PDS price reported by the household (P^{s}_{fijt}) multiplied by the quantity purchased from the PDS (q_{fijt}):

$$(1) \qquad S_{ijt} = \sum_{f} q_{fijt}(P^{m}_{fjt} - P^{s}_{fijt}) \qquad f = wheat, rice$$

Equation (2) describes the model used to study the effect of TPDS on the food grains subsidy received by BPL households:

$$(2)\ S_{ijt} = X_{it}\beta + \beta_c(\Pr Card_i * Post_t) + \delta_0 * \Pr Card_i + \delta_1 * D_{jt} + \pi_j + \pi_t + u_{ijt},$$

The per capita food price subsidy (S_{ijt}) is defined as a function of household characteristics, X_{it}, namely age (a set of dummy variables indicating age categories: 0-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, and 70 or older) and marital status of household head, their educational attainment (categorical variables indicating illiterate; literate with less than primary education; primary education; more than primary but less than secondary; and secondary or higher education), gender, occupation, education level of other household members (all illiterate; at least one, but not all, literate; all literate), household size (categorical variables indicating 1, 2, 3-5, 6-8, and 9 or more household members), caste (categorical variables indicating scheduled caste, scheduled tribe, and other castes) and religion (categorical variables indicating Hinduism, Islam, Christianity, Sikhism, Jainism, Buddhism, Zoroastrianism, and other religions), land ownership, whether land is irrigated, and ownership of durables, namely radio, TV, bicycles, electric fan, sewing machine, fridge, motor cycle, or car. D_{jt} denotes district-level time-varying factors namely mean district level monthly per capita expenditure, open market prices of rice and wheat, and district-specific trends. We begin the analysis without any district level time-varying controls and sequentially add these controls. π_j and π_t are district and year fixed effects. $\Pr Card_i$ is the predicted probability that the household has a BPL card. The variable $Post_t$ is equal to 1 if the observation is taken from the post-2002 period, after the TPDS expansion. The coefficient, β_c, estimates the effect of the TPDS on the average food price subsidy as the probability of BPL card ownership increases from 0 to 1.

The identifying assumption in equation (2) is that in the absence of TPDS, the change in food price subsidy in the pre- to post-policy period of households with a low probability of having a BPL card would be the same as that of households with a high probability of having a BPL card. This is a restrictive assumption. In general families with a low probability of owning a BPL card are likely to be richer than families with a high probability of owning a BPL card and the effect of economic factors on these two groups of families is likely to be very different. To allow more a reasonable comparison, we estimate equation (2) restricting samples to households with the monthly real per capita expenditure below the median[6].

We also experiment with an alternate specification, commonly referred to as a difference-in-differences analysis, which is described in equation (3):

(3) $S_{ijt} = X_{it}\tilde{\beta} + \beta_{DD}(Treat_i * Post_t) + \tilde{\delta}_0 * Treat_i + \tilde{\delta}_1 * D_{jt} + \tilde{\pi}_j + \tilde{\pi}_t + e_{ijt}$,

The symbol ~ is used to distinguish the parameters from equation (2). There is only one difference between equations (2) and (3). In equation (3), $\Pr Card_i$ is replaced by a binary variable indicating high-probability of BPL card ownership ($Treat_i$), which is equal to 1 if the household has at least a 50% probability of having a BPL card, otherwise 0. We call this group the treatment group and the low-probability BPL cardholder (treat=0) the comparison group. The

[6] The median per capita expenditure for our sample of states is Rs 484.30 at 2004-4005 prices, which is equal to \$1.75 per day at the ppp exchange rate of \$1=Rs 9.20

coefficient of interest is β_{DD} that estimates the effect of the TPDS on the food price subsidy received by the treatment group. The identifying assumption is that in the absence of the TPDS program the food price subsidy received by the treatment and comparison groups would be the same.

To increase the comparability of the treatment and comparison groups, here too, the sample of analysis is restricted to households with the monthly real per capita expenditure below the median. On average, the treatment group in our sample of PDS functioning states had a 65% probability of having a BPL/AAY card and the comparison group had a 26% probability of having a BPL/AAY card. Because the comparison group is also affected by the policy, in this alternate specification, β_{DD} would provide a downwardly biased estimate of the effect of the TPDS on the food price subsidy. The estimated effect would be 39% (=0.65-0.26) of the actual effect.

Appendix Table 1 presents the descriptive data on the treatment and comparison groups. In the pre-expansion period, the treatment group has a somewhat lower per capita monthly expenditure (8% lower) and fewer assets than the comparison group. The treatment group is also somewhat less educated and more likely to belong to a lower caste than the comparison group. However, the two groups spent the same amount on wheat and rice, the subsidized food grains. Overall, restricting the sample to households with less than the median per capita monthly expenditure improves the comparability of the treatment and comparison groups. Note that the regression analysis in equation (1) controls for these factors (education, asset ownership) and thus the identifying assumption in the difference-in-difference analysis is that in the absence of TPDS, the increase in subsidy for the target and the comparison groups would have been the same after controlling for a rich set of household characteristics and time-varying district level factors. Equations (2) and (3) are estimated on two sets of states: states with an efficient PDS system and states with a languishing PDS with low PDS take-up rates.

Results: Effect of TPDS on Food Price Subsidy

Table 1 presents the results from the analysis based on equations (2) and (3). Robust standard errors clustered around district of residence are in parenthesis. Row labeled 1 presents estimates based on equation (2) and row labeled 2 presents estimates from the alternate difference-in-difference specification based on equation (3). We present results from three different models. Model 1 includes controls for a rich set of individual characteristics, and district and year fixed effects. Model 2 includes additional controls for district specific linear trends and model 3 further adds three more controls: mean district per capita expenditure and the district level market prices of wheat and rice.

Estimates in row 1 suggest that an increase in the predicted probability of BLP card ownership (from 0 to 1) raised per capita food price subsidy by Rs 15 after the TPDS expansion in the rural areas of states with a functioning PDS. Inclusion of district specific linear trends (model 2) and average monthly per capita expenditure and district level open market prices of wheat and rice lowers the estimated effect somewhat. Overall, these models suggest that the TPDS expansion increased monthly per capita food price subsidy to households with a BPL card by Rs. 12 to Rs. 15 in states with a functioning PDS. This is six to seven times the average subsidy that households received in the period prior to the TPDS expansion. Estimates in states with a languishing PDS are modest – although statistically significant. The F-statistic for the interaction coefficient is 53.0 for model 3 for PDS functioning states and 8.8 for the languishing states suggesting we perhaps do not have the power in the first stage regression for the languishing states to estimate the effect of the food price subsidy on nutrition in the instrumental variables analysis discussed below. For the PDS-functioning states, the F-ratio is much larger than the critical F-ratio of 10 used to assess whether instruments are weak (see for example, Staiger and Stock, 1997; Cameron and Trivedi, 2005). Therefore, while we do all analysis for both the PDS functioning and languishing states, we discuss results for only the PDS functioning states. Results for the languishing states are presented in the Appendix.

The difference-in-difference estimates in row 2 suggest that TPDS raised the food price subsidy of the treatment group by Rs 3 to Rs 5 in states with a functioning PDS. Because not all households in the treatment group are at risk of receiving the treatment and because a small proportion of households in the comparison group are at risk of receiving the treatment, the difference-in-difference results are biased towards zero. Adjusting for this bias (dividing the coefficient with 0.39), our analysis suggests that TPDS increased the food price subsidy of the treatment group (those who got the treatment) by Rs 8 to Rs 12. These results are similar to the estimates in row 1. The difference-in-difference estimates of the effect of TPDS in languishing states are somewhat lower—between Rs 2 and Rs 3—but after adjusting for the downward bias these estimates also appear to be similar to the estimates in row 1.

Our analysis thus suggests that TPDS raised the food price subsidy of households with a BPL card and the effect size is non-trivial: about 6-7% of the total food expenditure in the pre-TPDS expansion period and 16-20% of the expenditure on wheat and rice in the pre-TPDS expansion period in states with a functioning PDS.

Estimation Strategy: Effect of Food Price Subsidy on Nutrition

Our next objective is to study the effect of food price subsidy on nutrition in the poor households. Equation (4) describes the empirical model:

(4) $N_{ijt} = X_{it}\phi + \varphi * Subsidy_{ijt} + \varphi_0 \Pr Card_i + \phi_0 * D_{jt} + \eta_j + \eta_t + e_{ijt}$,

N_{ijt} , the per capita nutrition in-take of household i in district j in year t, is defined as a function of household characteristics (X_{it}), per capita food grains subsidy ($Subsidy_{ijt}$), the predicted probability that the household has a BPL or AAY card ($\Pr Card_i$), time-varying district level variables that may influence nutrition (D_{jt}), and district (η_j) and year (η_t) fixed effects. We study three measures of nutrition: per capita daily calorie intake, per capita daily protein intake and per capita daily fat consumption.

Unobserved factors that determine food price subsidy may also affect nutrition levels. For instance, a demand shock that increases nutrition will also increase food prices, and in turn the amount of the subsidy. Thus, $Subsidy_{ijt}$ is likely to be endogenous to household nutrition (N_{ijt}). We use an instrumental variables methodology to address this issue. Specifically, we use the predicted probability of BPL card ownership interacted with $Post_t$ to instrument for $Subsidy_{ijt}$. The first stage regression for this methodology is described in equation (2). In the second stage, the predicted $\hat{S}ubsidy_{ijt}$ from equation (2) replaces $Subsidy_{ijt}$ in equation (3) to estimate the effect of price subsidy on nutrition. Note that the first stage estimate includes all the covariates that are in the second stage, so the identification of the coefficient φ in the second stage depends entirely on the exclusion of interaction term ($\Pr Card_i * Post_t$) from the second stage regression. In the empirical analysis, we use the IVREGRESS command of STATA to compute the first and second stage estimates as a single step. Standard errors correct for errors in the first stage prediction and cluster on district of residence (Murphy and Topel, 1985; Hardin, 2002; Hardin et al., 2003).

We also estimate reduced form models using specifications similar to equations (2) and (3) with one modification. The dependent variable in these analyses is per capita nutrition of household i. Further, similar IV and reduced form models are used to estimate the effect of food price subsidy and TPDS on calorie intake from specific food items, quantity/expenditure on food items, and total food and non-food expenditures. All models are estimated separately for the two groups: states with a functioning PDS and states with a languishing PDS.

Results: Descriptive

Table 2 presents the cost per kilo calorie, per capita daily calories, and share in total calorie consumption of various food items for the rural areas of PDS functioning and languishing states in the pre- to post-PDS expansion periods in families with less than the median per capita monthly consumption – the sample of our analysis. There are several points to note: one, in the pre-expansion period coarse grains were the cheapest source of calorie in PDS functioning states, but in the post-expansion period PDS wheat and rice became the cheapest source of calorie. Coarse grains, however, remained cheaper than the PDS and non-PDS wheat and rice combined. Two, prices of food items have been rising during the period of the study, but the increase is relatively low for wheat and rice – both PDS and open market.

Three, as found in previous research there is a decline in per capita daily calorie intake in both categories of states during the period of this study (Deaton and Drèze, 2009). Four, cereals – wheat, rice and coarse grains – are the primary source of calorie, accounting for 72% of the calorie intake in families with incomes below the median in PDS functioning states and PDS languishing states. Five, in the pre-TPDS expansion period, the share of PDS wheat and rice as the staple food for calorie in PDS functioning states was 5% and it increased to 14% in the post expansion period. In PDS languishing states, however, the proportion of PDS grain was a modest 2.3% in the pre-TPDS expansion period and remained roughly the same after the expansion. This is also reflected in the per capita monthly consumption of PDS rice and wheat: in PDS functioning states, the per capita consumption of PDS wheat and rice was 800 grams before the expansion and 2.2 kilograms after the expansion, in the PDS languishing states it remained close to 400 grams per capita in both periods (not presented in the Table).

Six, the share of coarse cereals as a source of calorie fell in PDS functioning states. Overall, households increased their total share of calories from the more expensive sources of calories, namely pulses, milk and milk products, edible oils, sugar and its substitutes, egg, fish, and meat by about 1 percentage point. Were these changes in sources of nutrition and consumption patterns caused by the increase in food price subsidy from the targeted Public Distribution System? Next, we investigate this using models described earlier.

Results: Effect of Food Price Subsidy on Nutrition

Table 3 has the estimates of the effect of food price subsidy on nutritional outcomes. Results are presented from five models: an OLS model and four different specifications of instrumental variable models: a levels model where both the nutrition variable and predicted subsidy amount are specified as levels, a log-linear specification where the nutrition variable is specified in log and the subsidy variable is in levels, and two log-log models where both nutrition and subsidy are specified in log to compute elasticity: the first log-log model does not control for household monthly expenditure, the second model does. Regressions in the right panel control for the following time-varying district effects: district level monthly per capita expenditure, district level price of wheat and rice and district specific linear trends. Previous research suggests that calorie and protein consumption across income quintiles has been declining in India. Regressions in the right panel are our preferred specification as they control for these trends.

The OLS results show that food price subsidy is associated with an increase in per capita calorie intake and per capita protein intake, but has no statistically significant association with per capita fat intake. As previously argued, food price subsidy is endogenous to nutrition and the instrumental variable estimates that address the endogeneity are negative and statistically insignificant, in the left panel that does not control for time-varying district effects. Coefficients from models in the panel on the right that control for time-varying district effects, on the other hand, suggest that food price subsidy had a negative and statistically significant effect on per capita calorie intake and per capita protein intake, but no effect on per capita fat intake. Estimates in the log-log model (right panel) suggest that a 10% increase in subsidy results in a 0.24% decline in per capita calorie intake and a 0.38% decline in per capita protein intake. The estimates are statistically significant in all four IV models for both calorie and protein intake in the panel on the right. The reduced form estimates in models without district-specific time-varying effects are negative but insignificant. Models that control for time-varying district effects suggest that a 10% increase in probability of BPL card ownership of families with less than the median expenditure lowered per capita daily calorie intake by 15 kilo-calories and per capita daily protein intake by 0.69 grams and had no impact on per capita fat intake.

To understand what led to these changes in nutrition, we investigate the effect of food prices subsidy on sources of calorie and consumption patterns. We study calorie intakes from seven different food categories: wheat and rice; coarse cereals; pulses; edible oil; milk, eggs, fish and meat; sugar and sugar substitutes; and all other foods. We run two sets of regressions: without any time-varying district level controls (Table 4) and with these controls (Table 5).

The OLS results show that food price subsidy increased calories from wheat and rice and sugar and sugar substitutes, but lowered calorie intake from coarse cereals and the estimates are roughly the same in Tables 4 and 5 – in models without and with district-level time-varying controls. The IV models (the log–log model) in Table 4 suggest that a 10% increase in food price subsidy increased calorie intake from wheat and rice by 0.9% and lowered calorie intake from coarse grains by 7% - leaving the overall calorie intake unchanged. Controlling for district level time-varying controls in Table 5 suggest that a 10% increase in food price subsidy increased calorie intake from wheat and rice by 0.8% and lowered calorie intake from coarse cereals by 9%. It also increases calorie intake from edible oil by 0.8% and sugar and sugar substitutes by 2% (significant in some models), thereby changing the consumption pattern to more expensive sources of calories and lowering the overall calorie intake. The reduced form estimates lead to the same conclusion.

Tables 6 and 7 present estimates of the effect of food price subsidy on actual quantity consumed and expenditures on food items. One consistent finding across all models in both tables is that food price subsidy increased the consumption of wheat and rice and lowered the consumption of coarse grains.

The bottom panel of both Tables provides the estimates of the effect of food price subsidy on (i) total monthly per capita expenditure on food, (ii) monthly per capita expenditure on non-food items, (iv) total monthly per capita expenditure. Estimates in Table 6 that do not control for time-varying district level factors suggest that a 10% increase in food price subsidy is associated with a 0.4% decline in expenditure on food, a 0.5% increase in expenditure on non-food items and no effect on total household expenditure. Models that control for district level time-varying factors on the other hand suggest that food price subsidy does not have any statistically significant effect on food and non-food expenditures.

In Table 8, we present estimates of the effect of targeted PDS from the difference-in-difference methodology. Model 1 controls for a rich set of household characteristics (listed in the notes to the model), district and year fixed effects. Models 2-4 sequentially add district specific trends (Model 2-4), mean district monthly per capita expenditure and district level market price of wheat and rice (Model 3-4), and the household monthly expenditure (Model 4). Results from Model 1 are all modest and statistically insignificant. Model (2) that controls for district specific trends suggests that TPDS lowered calorie and protein intake of the treatment group of families but had no effect on their per capita fat consumption. Estimated effects remain roughly of the same order as more controls are added in Model 3. Note that the difference-in-difference estimates are downward biased due to the presence in the treatment group of a small number of households who did not have BPL ration cards and the presence in the comparison group of households who did.

Table 9 has difference-in-differences estimates of the effect of the targeted PDS on per capita daily calories from specific food items and per capita consumption/expenditure of specific food items and total food and non-food expenditures. Overall, both sets of estimates suggest that the targeted PDS induced the treatment group to increase consumption of edible oil and sugar and sugar substitutes, expensive sources of calorie and lower consumption of coarse cereals, relatively cheaper sources of calorie.

Conclusion and Discussion

In this paper, we study the effect of an exogenous increase in food price subsidy to poor families resulting from the introduction in 1997 and expansion in 2002 of a targeted food price subsidy program in India called the Targeted Public Distribution System (TPDS). The Indian government issued ration cards, called BPL cards, to households with incomes below the official poverty threshold. The BPL cards enabled households to buy a certain quantity of wheat and rice at half the market price. The quantity initially fixed at 10 kg per household was raised to 35 kg in 2002. 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 resulting from the expansion of TPDS affected the nutritional intake and consumption patterns of poor families in rural India in states that have a well-functioning Public Distribution System.

The first stage estimates show that an increase in the predicted probability of BLP card ownership (from 0 to 1) during the post-TPDS expansion period raised per capita food price subsidy by Rs 15 in states with a functioning PDS. The results remain robust to model specifications that include controls for district specific linear trends and average monthly per capita expenditure and district level open market prices of wheat and rice. The estimated increase in subsidy is over seven times the average subsidy that households received in the period prior to the expansion of the TPDS. The increase in subsidy is approximately 6% of the per capita household expenditure on food and 16-20% of the average household expenditure on wheat and rice in the pre-policy period in PDS functioning states.

The instrumental variable estimates suggest that food price subsidy had a negligible to negative effect on calorie and protein intake and no statistically significant effect on fat intake. Further investigation shows that the food price subsidy on wheat and rice increased dependence on wheat and rice as a source of calorie. It also increased consumption of a few non-subsidized food items, namely edible oil and sugar and sugar substitutes and there is a corresponding decline in calorie intake from coarse grains, that are generally considered taste-wise inferior and less expensive substitutes of wheat and rice. The overall impact is a decline in calorie intake driven by a decline in consumption of coarse grains.

Our findings are similar to those of Jensen and Miller (2011) who found that food price subsidy in China had a negligible to negative effect on nutrition. However, the channel through which food price subsidy affected nutrition is somewhat different in our analysis. Jensen and Miller find that decline in nutrition resulting from food price subsidy is driven by families substituting more expensive food items for the subsidized food grains. In our study, however, we find that households are substituting the subsidized grains - rice and wheat - for the unsubsidized coarse grains that are somewhat cheaper sources of energy. This transition results in negligible to even negative effect on calorie and protein intake among households benefiting from the food price subsidy. There is also a transition towards certain more expensive sources of energy but the size of the effect, often significant, is relatively small.

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Table 1 Estimates of the Effect of Targeted Public Distribution on Food Price Subsidy

		States with Functioning PDS			States with Languishing PDS		
		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
(1)	Predicted probability of BPL card ownership*Post TPDS	14.667***	12.814***	12.087***	5.690***	4.350***	4.269***
		(1.868)	(1.748)	(1.660)	(0.957)	(1.468)	(1.437)
	F-Statistic	61.62	53.73	53.00	35.28	8.76	8.82
(2)	Difference-in-difference estimate	4.682***	3.428***	3.248***	2.661***	1.688**	1.598**
		(0.834)	(0.607)	(0.563)	(0.579)	(0.644)	(0.640)
	F-Statistic	31.47	31.92	33.29	21.16	6.86	6.25
	Model controls for:						
	District specific trend	No	Yes	Yes	No	Yes	Yes
	Mean district monthly per capita expenditure, district level market price of wheat and rice	No	No	Yes	No	No	Yes
	Mean subsidy	4.138	4.138	4.138	1.563	1.563	1.563
	Mean subsidy before TPDS expansion	2.096	2.096	2.096	1.370	1.370	1.370
	Mean subsidy before TPDS expansion for treatment group	3.098	3.098	3.098	2.076	2.076	2.076
	N	14,247	14,247	14,247	27,742	27,742	27,742

Notes: Each figure in the top row is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, predicted probability of BPL card ownership, year and district fixed effects. States with a functioning PDS are: Chhattisgarh, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Madhya Pradesh, and Uttaranchal. States with languishing PDS include: Assam, Bihar, Jharkhand, Punjab, Haryana, Gujarat, and West Bengal. Each figure in the row labeled difference-in-difference is also based on separate regressions that include all controls of the regressions in the top row except for the control on predicted probability of BPL card ownership, which is replaced by a dummy variable indicating that the household has a high probability of owning a BPL card (probability >50%) and the reported figures are the coefficient on the interaction term between a dummy variable on whether the household has a high probability of owning a BPL card and a dummy variable indicating that the observation is from the post-TPDS period. Standard errors clustered on district of residence are in parenthesis.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 2: Consumption Pattern in Households before and after the Expansion of the Targeted Public Distribution System

	States with Functioning PDS						States with Languishing PDS					
	Cost per kilo calories		Per capita daily calories		Share of total per capita daily calories		Cost per kilo calories		Per capita daily calories		Share of total per capita daily calories	
	Pre-TPDS Expansion	Post-TPDS Expansion	Pre-TPDS Expansion	Post-TPDS Expansion	Pre-TPDS Expansion	Post-TPDS Expansion	Pre-TPDS Expansion	Post-TPDS Expansion	Pre-TPDS Expansion	Post-TPDS Expansion	Pre-TPDS Expansion	Post-TPDS Expansion
Wheat & rice Open market	1.98	2.53	887	753	0.453	0.419	2.17	2.69	1312	1215	0.671	0.661
	(0.01)	(0.01)	(7.02)	(8.45)	(0.003)	(0.004)	(0.00)	(0.01)	(3.71)	(4.86)	(0.001)	(0.002)
Wheat & rice, PDS	1.39	1.63	91	247	0.050	0.141	1.37	1.26	41	47	0.023	0.026
	(0.01)	(0.01)	(2.27)	(5.91)	(0.001)	(0.003)	(0.01)	(0.02)	(0.88)	(1.86)	(0.001)	(0.001)
Coarse Cereals	1.19	1.73	413	283	0.219	0.159	1.43	1.97	83	71	0.044	0.038
	(0.01)	(0.01)	(5.36)	(5.97)	(0.003)	(0.003)	(0.01)	(0.04)	(1.70)	(2.39)	(0.001)	(0.001)
Pulses	4.77	6.69	99	84	0.053	0.048	4.98	7.63	68	57	0.035	0.031
	(0.02)	(0.02)	(0.58)	(0.59)	(0.000)	(0.000)	(0.01)	(0.02)	(0.36)	(0.36)	(0.000)	(0.000)
Milk & milk Products	8.21	12.14	67	60	0.034	0.033	9.73	14.67	55	55	0.029	0.030
	(0.06)	(0.12)	(1.46)	(1.14)	(0.000)	(0.001)	(0.05)	(0.16)	(0.65)	(1.18)	(0.000)	(0.000)
Edible oils	3.93	5.68	112	130	0.060	0.075	4.13	6.29	100	120	0.053	0.067
	(0.01)	(0.02)	(0.82)	(0.82)	(0.000)	(0.000)	(0.01)	(0.01)	(0.77)	(0.69)	(0.000)	(0.000)
Sugar and its Substitutes	3.04	4.45	94	88	0.051	0.051	3.15	4.73	61	57	0.033	0.032
	(0.01)	(0.02)	(0.59)	(0.71)	(0.000)	(0.000)	(0.01)	(0.02)	(0.42)	(0.53)	(0.000)	(0.000)
Egg, fish & Meat	33.90	50.34	6	5	0.004	0.003	29.71	41.66	14	14	0.008	0.008
	(0.28)	(0.50)	(0.19)	(0.11)	(0.000)	(0.000)	(0.19)	(0.27)	(0.12)	(0.18)	(0.000)	(0.000)
All other Foods	10.29	17.69	140	122	0.076	0.070	8.11	13.19	199	187	0.104	0.105
	(0.05)	(0.07)	(2.01)	(1.81)	(0.00)	(0.00)	(0.03)	(0.05)	(1.13)	(1.38)	(0.00)	(0.00)
Total	--	--	1908	1775	1.00	1.00	--	--	1928	1823	1.00	1.00
			(4.93)	(5.41)					(3.29)	(4.39)		

Notes: Wheat and rice = wheat, atta (flour), and rice. Coarse cereals are jowar (sorghum), bajara (pearl millet), maize, and ragi (finger millet). Pulses are arhar/tur (pigeon pea), whole and split gram, moong, masur (red lentil), urd (black gram), peas, soyabean, khesari (grass pea), besan (gram flour), and other pulses and gram products. Milk products include baby food, milk powder, curd, ghee, butter, and ice cream. Edible oils are vanaspati (hydrogenated oil), margarine, mustard oil, groundnut oil, and coconut oil. Sugar substitutes are gur, candy, misri, honey, and khandsari. Costs are in current prices. Standard errors are in parenthesis.

Table 3 Estimates of the Effect of Food Price Subsidy on Nutrition

	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log
Per capita Calorie intake										
Subsidy	2.631***	-2.019	-0.002	-0.006	-0.002	2.574***	-12.991**	-0.006*	-0.027**	-0.024*
	(0.545)	(4.789)	(0.003)	(0.011)	(0.011)	(0.491)	(5.600)	(0.003)	(0.013)	(0.014)
Post TPDS* Probability of BPL Card (Reduced form Model)	-24.516	---	---	---	---	-153.119**	---	---	---	---
	(70.504)					(63.812)				
Mean of the dependent variable	1865	1865	1866	1866	1866	1865	1865	1866	1866	1866
N	14,235	14,235	14,231	14,231	14,231	14,235	14,235	14,231	14,231	14,231
Per capita Protein intake										
Subsidy	0.084***	-0.046	-0.003	-0.010	-0.005	0.080***	-0.570***	-0.010**	-0.042***	-0.038**
	(0.017)	(0.159)	(0.003)	(0.013)	(0.012)	(0.015)	(0.197)	(0.004)	(0.015)	(0.016)
Post TPDS* Probability of BPL Card (Reduced form Model)	-0.585	---	---	---	---	-6.884***	---	---	---	---
	(2.338)					(2.070)				
Mean of the dependent variable	51.90	51.90	51.91	51.91	51.91	51.90	51.90	51.91	51.91	51.91
N	14,224	14,224	14,220	14,220	14,220	14,224	14,224	14,220	14,220	14,220
Per capita Fat intake										
Subsidy	-0.015	-0.015	-0.004	-0.015	-0.009	-0.014	0.129	0.003	0.013	0.018
	(0.013)	(0.113)	(0.004)	(0.015)	(0.017)	(0.012)	(0.172)	(0.006)	(0.028)	(0.028)
Post TPDS* Probability of BPL Card (Reduced form Model)	-0.194	---	---	---	---	1.582	---	---	---	---
	(1.693)					(2.099)				
Mean of the dependent variable	26.39	26.39	26.39	26.39	26.39	26.39	26.39	26.39	26.39	26.39
N	14,244	14,244	14,240	14,240	14,240	14,244	14,244	14,240	14,240	14,240
Model controls for:										
Mean district monthly per capita expenditure, district level market price of wheat and rice, and district specific trend	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household monthly expenditure	No	No	No	No	Yes	No	No	No	No	Yes

Notes: The sample of analysis is restricted to states with a functioning TPDS. OLS=ordinary least squares. IV=two-stage instrumental variable regression. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, the predicted probability of BPL card ownership, year and district fixed effects, in addition to the variables specified in the Table. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4 Estimates of the Effect of Food Price Subsidy on Per Capita Daily Calorie Intake from Specific Food Items
(Models do not control for district specific trends)

	Mean	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	Reduced Form Prob(BPLCard) *Post-TPDS
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Wheat and rice	1002	6.183***	11.227*	0.021**	0.080*	0.087**	170.803*
		(1.060)	(6.243)	(0.010)	(0.045)	(0.044)	(90.569)
Coarse cereals	357.9	-3.329***	-11.629**	-0.178***	-0.676***	-0.688***	-171.472**
		(0.797)	(4.850)	(0.064)	(0.251)	(0.253)	(73.700)
Pulses	94.13	0.059	0.402	-0.002	-0.009	-0.003	6.025
		(0.047)	(0.571)	(0.006)	(0.024)	(0.023)	(8.525)
Edible oils	117.8	-0.012	-0.013	-0.005	-0.019	-0.013	0.065
		(0.067)	(0.796)	(0.006)	(0.022)	(0.024)	(11.969)
Milk, eggs, fish and meat	70.33	-0.031	-0.383	-0.033	-0.126	-0.088	-5.629
		(0.091)	(0.543)	(0.037)	(0.143)	(0.143)	(7.991)
Sugar and sugar substitutes	91.12	0.126**	0.610	0.039	0.147	0.164	8.926
		(0.063)	(0.619)	(0.036)	(0.135)	(0.135)	(9.363)
All other foods	130.8	-0.165	-2.240*	-0.007	-0.027	-0.020	-32.775*
		(0.112)	(1.358)	(0.008)	(0.032)	(0.029)	(18.400)
Model controls for household monthly expenditure		No	No	No	No	Yes	No
N	14,293	14,243	14,243	13,669	13,669	13,669	14,301

Notes: The sample of analysis is restricted to states with a functioning TPDS. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, the predicted probability of BPL card ownership, year and district fixed effects. The dependent variable is per capita daily calorie from the food item listed in the row heading. The reported figures for Models 1-5 are the coefficients on food price subsidy and for Model 6 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. OLS=ordinary least squares. IV=two-stage instrumental variable regression. See notes to Table 2 for definitions of food items. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5 Estimates of the Effect of Food Price Subsidy on Per Capita Daily Calorie Intake by Food Groups
(Models control for district specific trends)

	Mean	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	Reduced Form Prob(BPLCard) *Post-TPDS
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Wheat and rice	1002	5.898***	6.329	0.018*	0.078*	0.083*	85.045
		(1.013)	(5.473)	(0.010)	(0.043)	(0.043)	(67.520)
Coarse cereals	357.9	-3.126***	-22.742***	-0.220***	-0.932***	-0.942***	-275.694***
		(0.766)	(5.833)	(0.069)	(0.328)	(0.329)	(59.953)
Pulses	94.13	0.021	0.226	-0.006	-0.024	-0.021	3.043
		(0.040)	(0.548)	(0.007)	(0.029)	(0.029)	(6.801)
Edible oils	117.8	0.003	2.037*	0.018*	0.075*	0.079*	24.690*
		(0.061)	(1.066)	(0.009)	(0.040)	(0.041)	(12.376)
Milk, eggs, fish and meat	70.33	0.004	0.110	0.018	0.075	0.104	1.689
		(0.072)	(0.788)	(0.055)	(0.237)	(0.229)	(9.648)
Sugar and sugar substitutes	91.12	0.131**	1.611***	0.041	0.174	0.188	19.778***
		(0.058)	(0.622)	(0.032)	(0.137)	(0.138)	(7.397)
All other foods	130.8	-0.169	-0.738	-0.002	-0.007	-0.002	-8.573
		(0.123)	(1.536)	(0.007)	(0.029)	(0.028)	(19.279)
Model controls for household monthly expenditure		No	No	No	No	Yes	No
N	14,293	14,243	14,243	13669	13669	13669	14301

Notes: The sample of analysis is restricted to states with a functioning TPDS. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, predicted probability of BPL card ownership, year fixed effects, district fixed effects, district specific trend, mean district monthly per capita expenditure, and district level market price of wheat and rice. The dependent variable is per capita daily calorie from the food item listed in the row heading. The reported figures for Models 1-5 are the coefficients on food price subsidy and for Model 6 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. OLS=ordinary least squares. IV=two-stage instrumental variable regression. See notes to Table 2 for definitions of food items. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 6 Estimates of the Effect of Food Price Subsidy on Consumption Pattern
(Models do not control for district level trends)

	Mean	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	Reduced Form Prob(BPLCard)* Post TPDS
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Wheat and rice	8.735	0.054***	0.099*	0.021**	0.081*	0.087**	1.504*
(quantity in kilograms)		(0.009)	(0.055)	(0.010)	(0.045)	(0.044)	(0.791)
Coarse cereals	3.155	-0.030***	-0.102**	-0.116***	-0.439***	-0.447***	-1.510**
(quantity in kilograms)		(0.007)	(0.043)	(0.040)	(0.158)	(0.160)	(0.651)
Pulses	57.46	0.000	0.001	-0.004	-0.015	-0.010	0.017
(Quantity in kilograms)		(0.000)	(0.005)	(0.007)	(0.025)	(0.024)	(0.077)
Edible oils	0.393	-0.000	-0.000	-0.005	-0.019	-0.014	-0.001
(Quantity in kilograms)		(0.000)	(0.003)	(0.006)	(0.022)	(0.023)	(0.040)
Milk, eggs, fish and meat	27.77	0.017	-0.348	-0.019**	-0.074**	-0.063*	-5.149
(in rupees at 2004-05 prices)		(0.033)	(0.257)	(0.009)	(0.034)	(0.034)	(3.695)
Sugar and sugar substitutes	11.68	-0.007	0.096	0.004	0.015	0.022	1.428
(in rupees at 2004-05 prices)		(0.007)	(0.076)	(0.007)	(0.025)	(0.024)	(1.128)
All other foods	53.29	-0.014	-0.295	-0.006	-0.021	-0.013	-4.176
(in rupees at 2004-05 prices)		(0.030)	(0.336)	(0.007)	(0.026)	(0.024)	(4.838)
Total expenditure on Food	220.2	-0.655***	-1.920**	-0.011**	-0.043***	-0.035**	-27.875**
(in rupees at 2004-05 prices)		(0.080)	(0.826)	(0.004)	(0.016)	(0.014)	(12.378)
Expenditure on high-cost	76.72	0.007	-0.404	-0.004	-0.017	-0.007	-5.888
(per calorie) food		(0.049)	(0.382)	(0.005)	(0.019)	(0.019)	(5.584)
Total non-Food Expenditure	121.0	0.203***	0.893	0.010*	0.036*	0.048**	13.118
		(0.071)	(0.631)	(0.005)	(0.020)	(0.019)	(9.531)
Monthly per capita	341.2	-0.442***	-1.036	-0.004	-0.014	-0.005	-14.873
expenditure		(0.108)	(0.906)	(0.003)	(0.011)	(0.007)	(13.399)
Model controls for household monthly expenditure	--	No	No	No	No	Yes	No
N	14,305	14,243	14,243	13,669	13,669	14,247	14,305

Notes: The sample of analysis is restricted to states with a functioning TPDS. OLS=ordinary least squares. IV=two-stage instrumental variable regression. See notes to Table 2 for definitions of food items. High-cost foods are edible oils, pulses, milk, eggs, fish, meat, and sugars. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, year fixed effects, district fixed effects, and predicted probability of BPL card ownership. The dependent variable is monthly per capita quantity/expenditure on food item listed in the row heading. The reported figures for Models 1-5 are the coefficients on food price subsidy and for Model 6 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7 Estimates of the Effect of Food Price Subsidy on Consumption Pattern
(Models control for district level trends)

	Mean	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	Reduced Form Prob(BPLCard)*Post
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Wheat and rice	8.735	0.052***	0.056	0.018*	0.078*	0.083*	0.749
(quantity in kilograms)		(0.009)	(0.048)	(0.010)	(0.043)	(0.043)	(0.592)
Coarse cereals	3.155	-0.028***	-0.200***	-0.145***	-0.614***	-0.620***	-2.426***
(quantity in kilograms)		(0.007)	(0.051)	(0.044)	(0.208)	(0.208)	(0.537)
Pulses	57.46	0.000	-0.002	-0.009	-0.039	-0.036	-0.023
(Quantity in kilograms)		(0.000)	(0.005)	(0.007)	(0.030)	(0.030)	(0.059)
Edible oils	0.393	0.000	0.007*	0.018*	0.075*	0.080**	0.084**
(Quantity in kilograms)		(0.000)	(0.004)	(0.009)	(0.040)	(0.041)	(0.042)
Milk, eggs, fish and meat	27.77	0.024	-0.048	-0.011	-0.046	-0.034	-0.428
(in rupees at 2004-05 prices)		(0.026)	(0.262)	(0.010)	(0.042)	(0.041)	(3.217)
Sugar and sugar substitutes	11.68	-0.004	0.207**	0.012*	0.050*	0.056*	2.569**
(in rupees at 2004-05 prices)		(0.007)	(0.092)	(0.007)	(0.030)	(0.030)	(1.071)
All other foods	53.29	-0.017	-0.161	0.005	0.020	0.026	-1.685
(in rupees at 2004-05 prices)		(0.030)	(0.257)	(0.005)	(0.021)	(0.020)	(3.126)
Total expenditure on Food	220.2	-0.643***	-1.083*	-0.005	-0.022	-0.017	-12.385
(in rupees at 2004-05 prices)		(0.072)	(0.624)	(0.003)	(0.014)	(0.015)	(7.783)
Expenditure on high-cost	76.72	0.018	0.545	0.008	0.034	0.042	6.857
(per calorie) food		(0.039)	(0.350)	(0.006)	(0.027)	(0.026)	(4.211)
Total non-Food Expenditure	121.0	0.144**	0.146	0.005	0.022	0.030	1.601
		(0.063)	(0.654)	(0.006)	(0.027)	(0.022)	(8.159)
Monthly per capita Expenditure	341.2	-0.489***	-0.910	-0.001	-0.005	0.001	-10.481
		(0.102)	(0.952)	(0.003)	(0.015)	(0.013)	(11.885)
Model controls for household monthly expenditure	--	No	No	No	No	Yes	No
N	14,305	14,247	14,247	14,247	14,247	14,247	14,305

Notes: The sample of analysis is restricted to states with a functioning TPDS. OLS=ordinary least squares. IV=two-stage instrumental variable regression. See notes to Table 2 for definitions of food items. High-cost foods are edible oils, pulses, milk, eggs, fish, meat, and sugars. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, predicted probability of BPL card ownership, district fixed effects, district specific trend, mean district monthly per capita expenditure, and district level market price of wheat and rice. The dependent variable is monthly per capita quantity/expenditure on food item listed in the row heading. The reported figures for Models 1-5 are the coefficients on food price subsidy and for Model 6 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8 Difference-in-differences estimates of the Effect of TPDS on Nutrition

	Model 1	Model 2	Model 3	Model 4
Per capita daily Calorie intake	-12.642	-39.432*	-40.972**	-38.034*
Difference-in-difference	(25.875)	(20.603)	(18.765)	(19.366)
Mean of the dependent variable	1865	1865	1865	1865
N	14,293	14,293	14,293	14,293
Per capita daily Protein intake	-0.302	-1.562**	-1.692***	-1.609**
Difference-in-difference	(0.859)	(0.681)	(0.625)	(0.620)
Mean of the dependent variable	51.87	51.87	51.87	51.87
N	14,282	14,282	14,282	14,282
Per capita daily Fat intake	0.321	0.837	0.778	0.833
Difference-in-difference	(0.708)	(0.864)	(0.846)	(0.851)
Mean of the dependent variable	26.38	26.38	26.38	26.38
N	14,302	14,302	14,302	14,302
Model controls for:				
District specific trend	No	Yes	Yes	Yes
Mean district monthly per capita expenditure, district level market price of wheat and rice	No	No	Yes	Yes
Household monthly expenditure	No	No	No	Yes

Notes: The sample of analysis is states with a functioning TPDS. Each figure is based on a separate regression. In addition to controls mentioned in the Table, each regression also controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, whether the household has a high probability of owning a BPL card, and year and district fixed effects. Reported figures are the coefficient on the interaction term between a dummy variable on whether the household has a high probability of owning a BPL card (probability>50%) and a dummy variable indicating that the observation is from the post-TPDS period. Standard errors clustered on district of residence are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9. Difference-in-differences Estimates of the Effect of the Targeted Public Distribution on Calorie Intake and Consumption Patterns

	Per Capita Daily Calorie				Per capita Consumption				
	Mean	Model 1	Model 2	Model 3	Unit	Mean	Model 1	Model2	Model 3
Wheat and rice	1002	46.915	16.325	13.943	kilograms	8.735	0.414	0.145	0.124
		(30.509)	(20.217)	(19.461)			(0.267)	(0.177)	(0.170)
Coarse cereals	357.9	-56.144**	-72.393***	-71.279***	kilograms	3.155	-0.488**	-0.628***	-0.619***
		(27.489)	(20.075)	(20.224)			(0.244)	(0.179)	(0.180)
Pulses	94.13	0.386	0.914	0.558	kilograms	0.808	-0.011	-0.007	-0.010
		(2.986)	(2.733)	(2.466)			(0.026)	(0.022)	(0.020)
Edible oils	117.8	3.621	10.280***	10.008***	kilograms	0.393	0.012	0.035***	0.034***
		(4.345)	(3.621)	(3.530)			(0.014)	(0.012)	(0.012)
Milk, eggs, fish and meat	70.33	-1.334	-0.833	-0.009	Rupees	27.77	-1.109	0.431	0.422
		(3.196)	(3.821)	(3.392)			(1.334)	(1.163)	(1.109)
Sugar and sugar substitutes	91.12	0.843	4.392*	4.585*	Rupees	11.68	0.265	0.551	0.619*
		(2.902)	(2.363)	(2.375)			(0.349)	(0.342)	(0.342)
All other foods	130.8	-6.732	3.134	2.455	Rupees	53.29	-1.393	-0.151	-0.345
		(6.485)	(5.844)	(5.678)			(1.732)	(1.030)	(1.026)
Expenditure on high-cost (per calorie) food	---	---	---	---	Rupees	76.72	-1.615	2.455	2.469*
							(2.045)	(1.500)	(1.456)
Total expenditure on Food	---	---	---	---	Rupees	220.2	-9.473**	-3.845	-3.146
							(4.327)	(2.651)	(2.464)
Total non-Food Expenditure	---	---	---	---	Rupees	121.0	3.906	1.499	1.184
							(3.402)	(2.437)	(2.398)
Monthly per capita expenditure	---	---	---	---	Rupees	341.2	-5.597	-2.222	-1.849
							(4.912)	(3.622)	(3.563)
Model controls for:									
District specific trend, mean district monthly per capita	---	No	Yes	Yes	---	---	No	Yes	Yes
expenditure, district level market price of wheat and rice	---	No	No	Yes	---	---	No	No	Yes
N	14,293	14,293	14,293	14,293	---	14,305	14,305	14,305	14,305

Notes: The sample of analysis is restricted to states with a functioning TPDS. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, whether the household has a high probability of owning a BPL card, and year and district fixed effects. See notes to Table 2 for definitions of food items. Reported figures are the coefficient on the interaction term between a dummy variable on whether the household has a high probability of owning a BPL card (probability>50%) and a dummy variable indicating that the observation is from the post-TPDS period. High-cost foods are edible oils, pulses, milk, eggs, fish, meat, and sugars. Standard errors clustered on district of residence are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix 1: Description of High-probability BPL Card Owners and Low-Probability BPL Card Owners

	States with Functioning PDS		States with Languishing PDS	
	Households with a High Probability of BPL Card Ownership	Households with a Low Probability of BPL Card Ownership	Households with a High Probability of BPL Card Ownership	Households with a Low Probability of BPL Card Ownership
Pre-TPDS Expansion Monthly Per Capita Expenditures				
Total Expenditure	319.04	345.58	335.92	346.81
Food Expenditure	210.16	228.62	237.26	248.37
Non-Food Expenditure	108.88	116.95	98.66	98.44
Wheat and Rice Expenditure	76.79	76.26	105.37	116.33
Coarse Cereals Expenditure	12.93	13.70	6.35	2.52
High-cost Foods Expenditure	64.54	82.69	62.58	71.44
Household Size	5.18	5.95	5.19	5.80
Male Head	0.92	0.93	0.91	0.92
Educational Attainment				
All illiterate	0.37	0.28	0.44	0.35
At least 1 literate	0.53	0.57	0.49	0.49
All literate	0.10	0.15	0.08	0.16
Caste				
Scheduled tribe	0.36	0.24	0.22	0.10
Scheduled caste	0.25	0.15	0.45	0.21
Others	0.39	0.62	0.33	0.69
Assets				
Owns Land	0.97	0.95	0.98	0.95
Land Possessed (Hectares)	0.51	1.85	0.21	1.03
Land Is Irrigated	0.10	0.31	0.18	0.31
Owns Radio	0.15	0.27	0.18	0.27
Owns TV	0.06	0.18	0.02	0.07
Owns Bicycle	0.29	0.39	0.30	0.41
Owns Electric Fan	0.09	0.27	0.08	0.11
Owns Sewing Machine	0.03	0.11	0.01	0.03
Owns Fridge	0.00	0.01	0.00	0.00
Owns Motorcycle	0.00	0.03	0.00	0.01
Owns Car	0.00	0.00	0.00	0.00
Educational Attainment of Household Head				
Not literate	0.61	0.51	0.67	0.52
Below primary	0.15	0.14	0.14	0.16
Primary	0.13	0.14	0.11	0.12
Middle	0.09	0.10	0.06	0.11
Secondary or higher	0.03	0.10	0.02	0.09
Occupation of Household Head				
Self-employed in non-agriculture	0.11	0.11	0.16	0.18
Agricultural labor	0.62	0.19	0.61	0.29
Other labor	0.12	0.07	0.11	0.09
Self-employed in agriculture	0.11	0.55	0.10	0.34
Other occupation	0.03	0.08	0.02	0.09
N	5,381	8,924	4,998	22,857

Notes: States with a functioning PDS are: Chhattisgarh, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Madhya Pradesh, and Uttaranchal. States with languishing PDS are: Assam, Bihar, Jharkhand, Punjab, Haryana, Gujarat, and West Bengal. Households with high probability of owning a BPL card have probability > 0.5.

Appendix Table 2. Estimates of the Effect of Food Price Subsidy on Nutrition
(PDS Languishing States)

	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log	OLS	IV Linear	IV Log-Linear	IV Log-log	IV Log-log
Per capita Calorie intake										
Subsidy	1.783**	9.495	0.004	0.015	0.018	2.006***	23.091	0.014	0.069	0.090
	(0.714)	(11.853)	(0.007)	(0.022)	(0.019)	(0.582)	(16.104)	(0.010)	(0.054)	(0.057)
Probability of BPL Card*Post	52.399	---	---	---	---	98.268*	---	---	---	---
(Reduced form Model)	(68.746)					(56.058)				
Mean of the dependent variable	1901	1901	1901	1901	1901	1901	1901	1901	1901	1901
N	27,726	27,726	27,724	27,724	27,724	27,726	27,726	27,724	27,724	27,724
Per capita Protein intake										
Subsidy	0.105***	0.385	0.004	0.015	0.018	0.102***	0.228	0.006	0.028	0.049
	(0.021)	(0.321)	(0.007)	(0.022)	(0.020)	(0.018)	(0.458)	(0.009)	(0.045)	(0.045)
Probability of BPL Card*Post	2.189	---	---	---	---	0.987	---	---	---	---
(Reduced form Model)	(1.900)					(1.995)				
Mean of the dependent variable	50.73	50.73	50.74	50.74	50.74	50.73	50.73	50.74	50.74	50.74
N	27,712	27,712	27,710	27,710	27,710	27,712	27,712	27,710	27,710	27,710
Per capita Fat intake										
Subsidy	0.018	0.102	0.008	0.027	0.031	0.023	-0.143	0.009	0.045	0.076
	(0.017)	(0.218)	(0.008)	(0.028)	(0.028)	(0.017)	(0.346)	(0.013)	(0.068)	(0.073)
Probability of BPL Card*Post	0.527	---	---	---	---	-0.608	---	---	---	---
(Reduced form Model)	(1.245)					(1.493)				
Mean of the dependent variable	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26	22.26
N	27,740	27,740	27,738	27,738	27,738	27,740	27,740	27,738	27,738	27,738
Model controls for:										
District specific trend, mean district monthly per capita expenditure, district level market price of wheat and rice	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Household monthly expenditure	No	No	No	No	Yes	No	No	No	No	Yes

Notes: The sample of analysis is restricted to states with languishing TPDS. OLS=ordinary least squares. IV=two-stage instrumental variable regression. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land is irrigated, ownership of durables, the predicted probability of BPL card ownership, year and district fixed effects, in addition to the variables specified in the Table. Standard errors clustered on district of residence, and corrected for two-stage estimation in IV models, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 3 Estimates of the Effect of Food Price Subsidy on Per Capita Daily Calorie Intake from Specific Food Items in PDS Languishing States (Reduced form estimates)

	Mean	OLS Subsidy	Reduced form ProbBPLCard* Post-TPDS	OLS Subsidy	Reduced Form ProbBPL card* Post-TPDS
		Model 1	Model 2	Model 3	Model 4
Wheat and rice	1330	2.110***	77.279	2.040***	104.553*
		(0.670)	(70.102)	(0.560)	(57.185)
Coarse cereals	76.50	-0.561*	-42.726	-0.488*	-12.330
		(0.295)	(31.912)	(0.257)	(36.899)
Pulses	64.73	0.125	10.798**	0.139	6.867
		(0.099)	(4.961)	(0.089)	(6.901)
Edible oils	105.0	-0.040	12.223	-0.017	14.257
		(0.094)	(9.832)	(0.091)	(10.457)
Milk, eggs, fish and meat	69.43	0.133	-3.207	0.105	-9.938
		(0.086)	(8.000)	(0.090)	(10.688)
Sugar and sugar substitutes	59.35	0.192***	2.995	0.226***	5.220
		(0.064)	(4.972)	(0.061)	(5.703)
All other foods	195.3	-0.173	-1.626	0.007	-3.976
		(0.204)	(18.848)	(0.203)	(16.990)
Model controls for district specific trend, mean district monthly per capita expenditure, district level market price of wheat and rice	---	No	No	Yes	Yes
N	27,843	27,730	27,839	27,730	27,765

Notes: The sample of analysis is restricted to states with a languishing TPDS. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land is irrigated, ownership of durables, the predicted probability of BPL card ownership, year and district fixed effects. The dependent variable is per capita daily calorie from the food item listed in the row heading. The reported figures for Models 1 and 3 are the coefficients on food price subsidy and for Models 2 and 4 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. OLS=ordinary least squares. See notes to Table 2 for definitions of food items. Standard errors clustered on district of residence are in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4 Estimates of the Effect of Food Price Subsidy on Consumption Pattern in PDS Languishing States

	Mean	OLS	Reduced Form ProbBPLCard*Post	OLS	Reduced Form ProbBPLCard*Post
		Model 1	Model 2	Model 3	Model 4
Wheat and rice	11.57	0.019***	0.676	0.018***	0.900*
(quantity in kilograms)		(0.006)	(0.610)	(0.005)	(0.498)
Coarse cereals	0.690	-0.005*	-0.369	-0.005*	-0.117
(quantity in kilograms)		(0.003)	(0.284)	(0.002)	(0.327)
Pulses	0.549	0.001	0.052	0.001	0.048
(Quantity in kilograms)		(0.001)	(0.045)	(0.001)	(0.059)
Edible oils	0.350	-0.000	0.038	-0.000	0.050
(Quantity in kilograms)		(0.000)	(0.033)	(0.000)	(0.035)
Milk, eggs, fish and meat	34.47	0.014	-3.197	0.007	-7.321**
(in rupees at 2004-05 prices)		(0.046)	(2.690)	(0.040)	(3.420)
Sugar and sugar substitutes	7.693	0.010	0.002	0.016**	0.789
(in rupees at 2004-05 prices)		(0.008)	(0.709)	(0.007)	(0.714)
All other foods	60.12	-0.021	0.753	0.007	-1.994
(in rupees at 2004-05 prices)		(0.051)	(3.790)	(0.048)	(3.840)
Total expenditure on Food	246.5	-0.833***	-0.557	-0.817***	0.443
		(0.086)	(7.099)	(0.076)	(7.616)
Expenditure on high-cost	72.72	0.028	-4.131	0.039	-4.612
(per calorie) food		(0.046)	(3.535)	(0.043)	(4.276)
Total non-Food Expenditure	104.6	0.081	1.480	0.117*	-0.363
		(0.072)	(7.665)	(0.060)	(8.387)
Monthly per capita Expenditure	351.1	-0.752***	0.923	-0.699***	0.080
		(0.120)	(10.359)	(0.100)	(13.228)
Model controls for district level trend, mean district monthly per capita expenditure, district level market price of wheat and rice	---	No	No	Yes	Yes
N	27,843	27,730	27,839	27,730	27,765

Notes: The sample of analysis is restricted to states with languishing TPDS. OLS=ordinary least squares. See notes to Table 2 for definitions of food items. High-cost foods are edible oils, pulses, milk, eggs, fish, meat, and sugars. Each figure is based on a separate regression that controls for household head's age, education, gender, marital status, and occupation, education of other household members, household caste and religion, land ownership, household size, whether land irrigated, ownership of durables, year fixed effects, district fixed effects, and predicted probability of BPL card ownership. The dependent variable is monthly per capita quantity/expenditure on food item listed in the row heading. The reported figures for Models 1 and 3 are the coefficients on food price subsidy and for Models 3 and 4 the coefficient on the interaction of predicted probability of BPL card ownership and post-TPDS period. Standard errors clustered on district of residence are in parentheses. *** p<0.01, ** p<0.05, * p<0.1