Food Subsidies and Nutritional Status: Evidence from ICRISAT Data

Priya Bhagowalia*
Centre for International Trade and Development
Jawaharlal Nehru University
New Delhi
*Corresponding author: bhagowalia@alumni.purdue.edu

Arjita Chandna
Centre for International Trade and Development
Jawaharlal Nehru University
New Delhi

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Abstract

This paper attempts to assess if provision of subsidized food via India's largest safety net, the Targeted Public Distribution System (TPDS), has improved calorie availability in dry land areas of India. Changes in relative prices may increase calorie intakes from the subsidized commodities, or induce a substitution away from inexpensive and calorie rich foods to more expensive foods. We use ICRISAT data from 2010-2012 to examine the impact of rice & wheat subsidies on calorie availability and compare it with equivalent increases in income from any other source. Our results suggest that food subsidies have a modest but positive impact on calorie intakes of households, but these differ by income group. Due to the subsidy, households increase calories from both subsidized and expensive sources of calories viz. meat, sugar and oils. Crop production affects calorie availability. We also find that that the in-kind transfer seems to be less effective than equivalent increases in income

I. Introduction

Malnutrition remains a serious concern in India despite rapid economic growth. While GDP grew at annual rate of 6-7 percent or even higher between 1992-93 and 2005-06[1], stunting decreased by less than one percentage point per year from 1998-2004 to 45 percent, and wasting among children aged 0-3 years increased from 18 percent to 23 percent in 2004-05 (NFHS, 2005-06). During the period 1983-2009, estimated average calorie intake in rural India declined by about 15 percent, while the real monthly per capita expenditure increased by 42 percent in rural areas (Basole and Basu, 2015). Deaton and Dreze (2005) find that the household per capita calorie intake declined by 2.4 percent in urban areas from 1983 to 2004-05, while household per capita protein intake declined by 12 percent in rural areas and 4.6 percent in urban areas.

Reasons for the decline in calorie and protein intakes, range from increasing expenditure on non food items (Banerjee and Duflo 2011; Basole and Basu, 2015), decrease in physical activity (Deaton and Dreze 2009), inequality in per capita incomes and increases in the relative price of food (Gaiha, Jha and Kulkarni. 2010), to a downward – bias in estimates of calorie consumption on account of the rising importance of food consumed away from home (Smith, 2013).

The Public Distribution System (PDS) is the largest food subsidy system in India, distributing food staples such as rice, wheat, coarse cereals, pulses along with kerosene, edible oil and other items. Several studies have evaluated the performance of the PDS documenting various shortcomings such as diversion to open market (Jha et al., 2012; Ahluwalia, 1993), high fiscal costs (Kochar, 2005) and errors in targeting (Khera, 2011). The Targeted Public Distribution System (TPDS) introduced in 1997, classifies households as below the poverty line (BPL) and above the official poverty line (APL), in an attempt to improve targeting and reduce costs. The TPDS currently, imposes a fiscal burden of over $ 12 billion annually[2].

This study attempts to assess if provision of subsidized food via India's largest safety net, the Targeted Public Distribution System (TPDS), has improved calorie availability in dry land areas of India. Few studies have analyzed the impact of the food subsidy system on nutrition in India.

[1] http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?page=1

[2] http://articles.economictimes.indiatimes.com/2013-03-11/news/37623863_1_subsidy-bill-subsidy-burden-rice-and-wheat

Tarozzi (2005), and Shaw and Telidevara (2014), Kaushal and Muchomba (2015) find that the food subsidy has not had a significant impact on anthropometrics or nutrients intake but Kochar (2005) finds a marginal impact of the subsidy in nutrition.

We also try to compare the impact of the PDS rice or wheat subsidy on the calorie availability with equivalent increases in income from any other source. Microeconomic theory predicts that, the impact of an in-kind transfer will be the same as that of a cash transfer if the quantity of the subsidized commodity purchased is more than the quota (Kennedy and Alderman, 1987) but may be different if consumption is below quota. The rest of this paper is organized as follows. Section 2 provides a brief overview of the literature. Section 3 describes the data set and the methodology used. Section 4 presents the results and section 5 concludes.

II. Overview of the literature

Kennedy and Alderman (1987) and Moffitt (1989), explain the effect of a food subsidy subject to a maximum quantity quota. Food subsidies with a maximum entitlement or quota introduce a kink in the budget constraint. Consumers purchasing more than the ration quota, experience a pure income effect, while those below the quota face both substitution and income effects (Moffitt 1989; Deaton, 1984). Changes in relative prices may increase consumption of the subsidized commodities if they are normal goods, or induce a substitution away from inexpensive and calorie rich foods to more expensive foods. Together, the income and substitution effects will affect calorie intakes.

A review of income and price elasticities found in literature is useful for predicting the responsiveness of household demand for nutrients to the subsidy and also comparing it with other forms of food support. Estimates of the income elasticity of calories found in the literature are generally positive although the magnitude varies between 0.3 to 0.96 (see for instance, Behrman and Deolalikar, 1987; Ravallion, 1990; Bouis and Haddad, 1992; Radhakrishna 1997; Subramanian and Deaton, 1996; Gibson and Rozelle, 2000; Abdulai and Aubert, 2004; Ecker and Qaim, 2008; Ulimwengu et al, 2012). The elasticity of wasting with regard to income are lower than the income elasticity of calories because anthropometric measurements depend on several factors besides food consumption (see Bouis and Haddad, 1992; Block, Masters and Bhagowalia, 2012).

Reasons for the variance in estimates could be differences in methodologies used to address the problems of aggregation of food expenditures, adjustments for meals received outside the home, specification and measurement errors. Calorie elasticities can be calculated from food expenditure elasticities which are multiplied by the calorie shares of food groups (Murty and Radhakrishnan, 1981; Pitt, 1983).

For own price changes, the substitution effect is negative for normal goods. However, the impact of a price change on calories, depends on the composition of consumption and calorie content of the food groups. For example, if the price of calorie dense food decreases, and it is substituted for by more expensive foods that are relatively low in calories, then the substitution effect will be positive but the overall impact on calories may be negative. Price elasticities are found to vary from -0.484 in Bangladesh (Pitt,1983), -0.053 but insignificant in Papua Guinea (Gibson and Rozelle, 2000), to -0.12 and significant in India (Gaiha et al, 2012).

The income increase from PDS not only increases income but also this results specifically from an in-kind transfer. Cross-country evidence shows a number of studies where forms of in-kind transfer have been compared to cash transfers with mixed evidence (Laderchi, 2001; Ahmed et al., 2009; Hidrobo et al., 2012).

III. Data and empirical specification

III.1 Data

We use data on household consumption expenditures and demographic characteristics from International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), village dynamics in semi-arid tropics (VDSA) from 18 villages in India for the years 2010, 2011 and 2012. The villages in India are selected from the five states of Andhra Pradesh, Gujarat, Karnataka, Maharashtra and Madhya Pradesh.

Households for which the PDS price of rice or wheat was greater than the village average open market price are excluded[3]. Based on these assumption, for we have a sample size of 2596

[3] 7 observations for rice and 35 for wheat were dropped since the PDS price was higher than the market price or the subsidy could not be calculated

household-year observations. ICRISAT reports consumption data for 12 rounds (roughly one round for every month) which is averaged to obtain a monthly average for each year, corresponding to each household. Data on calorie conversion factors is taken from FAO's food balance sheet, Annex 1. The data on Price Index comes from Agricultural Laborers Consumer Price Index for year 2010, 2011 and 2012.

III.2 Empirical Specification

The effect of the subsidy can be quantified by directly regressing calorie intakes on the value of the subsidy but this may give biased results. Households may have certain unobservable characteristics that are correlated with access to PDS, purchase from the PDS and nutritional outcomes. Hence, the value of subsidy is likely to be endogenous.

To deal with the self selection bias, we can either use an exogenous policy variation in PDS subsidy parameters or in the value of subsidy, or use instrument variables for the subsidy. Kochar (2005) and Kaushal and Muchomba (2013) use the BPL status to impute access to PDS as an identification strategy. If BPL card data is not available, BPL status could be incorrectly imputed to ineligible households, resulting in a downward bias in the effect of the subsidy. These problems do not arise in our data as we are able to incorporate for household heterogeneity using panel data methods.

III.2.1 Rice or wheat subsidies have a positive effect on calorie intakes.

For testing this hypothesis we use the following specification.

$$\ln C_{ijt} = \alpha + F_i + \beta \ln Vsub_{ijt} + \delta \ln E_{it} + \theta \ln P_{ijt} + \gamma X_{it} + S_1 + \sigma S_2 + \tau S_3 + \psi S_4 + \varepsilon i_{jt}$$

Where C_{ijt} is the calorie availability to the ith household in jth village in tth year.

F_i is the additional time invariant fixed effect intercept

$Vsub_{ijt}$ is the value of PDS rice subsidy for ith household in jth village in tth year, calculated as difference between the market price of rice or wheat and the PDS price of rice or wheat, multiplied by the quantity purchased from PDS for the ith household, in the jth village in the tth year.

E_{it} is the total expenditure for ith household in tth year deflated using the agricultural labor consumer price index.

P_{ijt} is the average price of cereals in j[th] district in t[th] year deflated by Agricultural Laborer Consumer Price Index in the current year to measure the real impact.

X_{it} is the vector of household characteristics that includes dummy for gender, education and main occupation of household head; household size; demographic composition of household; consumer durable index; total land holdings and total irrigated land of the household or crop production.

S_1, S_2, S_3 and S_4 are the dummies for four states other than the base category state

ε_{it} is the error term

III.2.2 Food subsidies have the same impact on calories as income from any other source

To compare the effect of the in-kind transfer with an equivalent out of pocket expenditure, we define total income , represented by E^*_{it} to which we add the value of the subsidy.

$$\ln C_{ijt} = \alpha + F_i + \eta \ln E^*_{it} + \theta \ln P_{ijt} + \gamma X_{it} + \vartheta S_1 + \sigma S_2 + \tau S_3 + \psi S_4 + \varepsilon i_{jt}$$

It has same variables as first specification except:

E_{it} is replaced by E^*_{it} ,which is the deflated total expenditure including the value of the subsidy for i[th] household in t[th] year;

F_i is the additional time invariant fixed effect intercept;

X_{it} now includes only household size; demographic composition of household

This variable E^*_{it} will compare the general income increase of PDS subsidy when income is increased by an amount equivalent to either the rice or wheat subsidy.

IV. Results

Our results are based on households with record positive purchases for any commodity from the PDS. Table 1 shows year-wise mean and standard error of general characteristics of PDS households and full sample households.

Over time the monthly household and daily per capita expenditure increases by a small amount although the daily per capita expenditure is close to the official poverty line of Rs. 32 per day. Food expenditures account for almost 60 percent of the budget in all years. In all years, the average daily per capita calorie intake is less than the recommended norm of 2400 Kcal/day in rural areas. The

budget and calorie share of two major food groups suggest that cereals are an inexpensive source of calories.

Table 1: Household characteristics of PDS and all households

Variable	Mean for full sample			Mean for PDS users		
	2010	2011	2012	2010	2011	2012
Monthly household total expenditure (Rs)	6451.58	7253.73	7864.69	6076.11	7052.11	7550.73
Daily per capita total expenditure (Rs)	44.60	50.83	57.59	42.83	49.72	54.46
Food expenditure as proportion of total expenditure	0.58	0.57	0.57	0.58	0.57	0.57
Daily per capita calorie intake (Kcals)	1775	1774	1803.36	1789.50	1775.88	1780.89
Cereal expenditure as proportion of food expenditure	0.21	0.22	0.22	0.21	0.22	0.22
Cereal calories as proportion of total calories	0.68	0.69	0.67	0.69	0.70	0.68
Sample size	866	868	862	720	680	701

Notes: 1. Daily per capita expenditure and daily per capita calorie is calculated by dividing expenditure and calorie by family size and 30. 2. Cereals include rice, wheat, millets, sorghum, maize. 3. Budget and calorie share of food groups are calculated by dividing expenditure and calorie content of a food group by total expenditure and total calorie intake, respectively.

Table 2 computes the year wise average price, quantity and subsidy for all households and across expenditure quartiles. A substantial price discount is given to those purchasing rice and wheat from PDS. Despite a sharp rise in the value of the subsidy for both rice and wheat, the off-take from PDS has not increased proportionally over time, indicating that the increase in the value of the subsidy has been on account of increase in market prices.

Table 2: Average price, quantity and subsidy on rice and wheat

Variable	2010				2011				2012			
	Bottom	Middle	Top	All	Bottom	Middle	Top	All	Bottom	Middle	Top	All
PDS price of rice (Rs/kg)	4.13	4.60	4.65	4.41	4.10	4.94	4.91	4.67	3.61	4.32	4.66	4.25
PDS price of wheat (Rs/kg)	8.64	8.34	9.61	8.82	7.16	6.78	8.04	7.32	7.94	8.42	8.93	8.51
PDS quantity of rice (kg)	9.52	11.16	11.14	10.36	10.18	10.61	11.00	10.60	10.76	11.25	10.88	10.9
PDS quantity of wheat (kg)	11.19	12.39	10.34	11.34	10.76	11.08	12.12	11.34	7.93	10.30	12.73	10.4
Value of subsidy of rice (Rs)	127.27	157.2	167.0	144.9	158.27	170.38	181.3	170.2	222.18	252.62	222.5	232
Value of subsidy of wheat (Rs)	95.3	103.1	90.55	100	98.20	101.59	123.7	108.4	92.70	123.64	158.2	126

On average, households in the lower expenditure quartile buy rice and wheat at lower prices relative to the other quintiles with the exception being the middle quartile that pays a lower price for wheat Despite the relatively lower price, the off take is lower than that of the middle and high expenditure quintiles. The value of rice subsidy increases over time for all quintiles, but the value of the wheat subsidy decreases for the bottom quartile while it increased for the middle and top quartiles from 2010 to 2012.

Tables 3A and 3B show the elasticity of calorie intake with respect to the subsidy for different specifications. The elasticity of calorie intakes with respect to the rice and wheat subsidy are 0.03 and 0.06 respectively (fixed effects) and the expenditure elasticity is 0.35 and significant. Our preferred estimates with time fixed effects and random effects are lower but significant. The coefficient for average price of cereals is negative as expected and significant. Both total land area and irrigated area are statistically insignificant. Household size has a positive impact on calories.

Table 3A: Impact of rice subsidy on calorie intakes, ICRISAT, 2010, 2011, 2012

	FE	FE TIME	RE	RE TIME
Ln Rice subsidy	-0.02**	0.04**	0.02**	0.03***
	(0.01)	(0.02)	(0.01)	(0.01)
Ln Real expenditure	0.34***	0.35***	0.38***	0.38***
	(0.04)	(0.04)	(0.02)	(0.02)
Cereal price	-3.42	-2.23	-5.87***	-6.73***
	(2.15)	(2.22)	(1.18)	(1.25)
Total agricultural area	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Irrigated area	0.00	0.00*	0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Household Size	0.05***	0.04***	0.07***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
Proportion of members below 1 year	0.61***	0.50***	0.46***	0.42***
	(0.18)	(0.18)	(0.15)	(0.15)
Proportion of members 1-5 years	0.30***	0.24***	0.27***	0.27***
	(0.09)	(0.09)	(0.07)	(0.07)
Proportion of members 5-15 years	0.34***	0.27***	0.45***	0.43***
	(0.08)	(0.07)	(0.06)	(0.06)
Proportion of members 15-49 years	0.27***	0.23***	0.31***	0.29***
	(0.07)	(0.06)	(0.06)	(0.06)
Proportion of members more than 49 years	0.40***	0.34***	0.39***	0.39***
	(0.09)	(0.08)	(0.06)	(0.06)
Cereal production	0.01	0.01	0.03***	0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
Pulse production	0.03**	0.01	0.02*	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
N	1002.00	1002.00	1002.00	1002.00

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Agricultural activities have been shown to be correlated with improvements in nutritional status of the households (Bhagowalia, Headey and Kadiyala, 2012). To examine if agricultural activities such as cereal and pulse production have an impact on calories in the presence of subsidies, we include dummy variables if the household produces any cereals or pulses on their farm. Cereal production has a positive effect on calorie intakes but pulse production is statistically insignificant when the rice subsidy is given.

Table 3B: Impact of cereal and pulse production on calorie intakes (wheat), ICRISAT, 2010, 2011, 2012

	FE	FE TIME	RE	RE TIME
Ln wheat subsidy	0.06***	0.11***	0.03***	0.03***
	(0.02)	(0.02)	(0.01)	(0.01)
Ln Real expenditure	0.34***	0.33***	0.37***	0.37***
	(0.04)	(0.05)	(0.03)	(0.03)
Cereal price	-3.23	-5.91**	-5.54***	-5.84***
	(2.13)	(2.57)	(1.23)	(1.27)
Total agricultural area	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Irrigated area	-0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Household Size	0.04***	0.04***	0.07***	0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
Proportion of members below age 1 year	0.60***	0.42**	0.50***	0.45***
	(0.15)	(0.17)	(0.12)	(0.12)
Proportion of members 1-5 years	0.29**	0.19	0.29***	0.28***
	(0.12)	(0.12)	(0.08)	(0.08)
Proportion of members 5-15 years	0.29***	0.23**	0.46***	0.45***
	(0.10)	(0.09)	(0.07)	(0.07)
Proportion of members 15-49 years	0.29***	0.27***	0.31***	0.31***
	(0.09)	(0.08)	(0.07)	(0.07)
Proportion of members more than 49 years	0.41***	0.40***	0.43***	0.43***
	(0.12)	(0.10)	(0.08)	(0.07)
Cereal production	-0.01	-0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.01)
Pulse production	0.03**	0.01	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
N	790.00	790.00	790.00	790.00

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The food subsidy has both income and substitution effects for households that are consuming below the entitlement. While it is difficult to separate the two, we can perceive changes in the

consumption basket by looking at the impact of the subsidy on different food groups (table 4). The rice subsidy allows households to increase consumption of both PDS and market rice and PDS wheat but also permits substitution away from coarse cereals to more expensive sources of calories such as sugar and oils. The wheat subsidy increases calories consumed from PDS rice and wheat, coarse cereals, meat, and sugar.

Table 4: Impact of rice and wheat subsidy on calories from different food groups

	Ln Rice subsidy	Ln wheat subsidy
PDS rice	0.54***	0.31***
PDS wheat	0.09***	0.28***
Rice	0.26***	0.03
Wheat	-0.01	0.05
Millets	0.03	0.04
Sorghum	-0.15***	0.12**
Cereals	-0.02	0.10***
Coarse cereals	-0.21***	0.09**
Milk	-0.10***	0
Meat	0.04	0.27***
Sugar	0.06***	0.11***
Oils	0.05***	-0.01
Fats	-0.04	-0.07

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To check for accuracy of targeting, we separately look at the effect of PDS subsidy across three expenditure quintiles (Table 5) and quota (Table 6). The rice and wheat subsidy have a significant impact on calorie for those at the middle of expenditure distribution. The expenditure elasticity remains positive and significant. Price of cereals negatively and significantly affects calorie intake.

Table 5: Random effects estimates of the impact of rice and wheat subsidy on calories for different income quintiles, ICRISAT, 2010, 2011, 2012

	RICE			WHEAT		
	bottom	middle	top	bottom	middle	top
Ln subsidy	0.08***	0.09***	0.07***	-0.04***	-0.03***	0.04***
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
Ln real total expenditure	0.44***	0.60***	0.36***	0.50***	0.51***	0.26***
	(0.05)	(0.06)	(0.05)	(0.06)	(0.07)	(0.05)
Cereal price	-7.86***	-9.60***	-6.21***	-8.76***	-7.50***	-4.02**
	(1.70)	(1.69)	(2.12)	(2.13)	(1.80)	(1.95)
Total area	-0.00	-0.00*	0.00	-0.00	-0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Irrigated area	0.00	0.00*	-0.00	0.00*	0.00*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Household size	0.09***	0.07***	0.06***	0.08***	0.07***	0.07***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Proportion of members below age 1 year	0.17	0.37**	0.53***	0.36	0.41*	0.71***
	(0.22)	(0.17)	(0.19)	(0.29)	(0.22)	(0.19)
Proportion of members 1-5 years	0.44***	0.16	0.44***	0.27*	0.08	0.55***
	(0.13)	(0.11)	(0.11)	(0.16)	(0.12)	(0.11)
Proportion of members 5-15 years	0.54***	0.47***	0.73***	0.54***	0.46***	0.87***
	(0.10)	(0.08)	(0.10)	(0.13)	(0.10)	(0.10)
Proportion of members 15-49 years	0.41***	0.37***	0.52***	0.44***	0.39***	0.63***
	(0.09)	(0.07)	(0.10)	(0.11)	(0.09)	(0.10)
Proportion of members more than 49 years	0.44***	0.40***	0.61***	0.40***	0.44***	0.82***
	(0.08)	(0.09)	(0.11)	(0.11)	(0.12)	(0.11)
Agricultural household	0.03	0.05**	0.09***	0.04	0.08***	0.08***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
_cons	9.99***	9.74***	10.03***	10.40***	10.40***	10.24***
	(0.13)	(0.16)	(0.17)	(0.14)	(0.19)	(0.16)
N	621.00	542.00	511.00	445.00	432.00	410.00

*$p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6 shows that the rice subsidy has a positive and significant effect on households that consume more than the quota which is similar to an income effect.

Table 6: RE estimates of rice subsidy by quantity purchased, ICRISAT, 2010, 2011, 2012

	Rice		Wheat	
	20kg	35kg	20kg	35kg
Ln subsidy	-0.01	0.02***	0.01	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Ln real total expenditure	0.33***	0.39***	0.27***	0.37***
	(0.03)	(0.03)	(0.05)	(0.03)
Cereal price	-5.88***	-11.55***	-9.59***	-9.03***
	(2.23)	(1.33)	(2.68)	(1.29)
Total area	-0.00**	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Irrigated area	0.00**	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Household size	0.08***	0.06***	0.09***	0.06***
	(0.01)	(0.00)	(0.01)	(0.00)
Proportion of members below 1 year	0.36	0.26*	0.91***	0.20
	(0.27)	(0.15)	(0.31)	(0.18)
Proportion of members 1-5 years	0.42***	0.25**	0.55***	0.18*
	(0.11)	(0.10)	(0.17)	(0.10)
Proportion of members 5-15 years	0.53***	0.51***	0.65***	0.42***
	(0.09)	(0.09)	(0.15)	(0.10)
Proportion of members 15-49 years	0.44***	0.35***	0.52***	0.28***
	(0.09)	(0.09)	(0.13)	(0.10)
Proportion of members more than 49 years	0.39***	0.48***	0.49***	0.45***
	(0.09)	(0.09)	(0.14)	(0.10)
Agricultural household	0.03	0.05***	0.03	0.05***
	(0.03)	(0.02)	(0.03)	(0.02)
_cons	10.89***	11.00***	10.87***	11.10***
	(0.12)	(0.10)	(0.17)	(0.10)
N	405.00	548.00	245.00	449.00

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Our second hypothesis attempts to examine if the in-kind subsidy is superior to an increase in income from any other source. In the absence of data on cash transfers, we try to estimate the total expenditure elasticity where expenditure is increased by an amount equivalent to the value of the subsidy. The expenditure elasticity is 0.19 for both rice and wheat subsidy (table 7). Although this is a crude estimate, it indicates the changes in calorie intakes if the in-kind subsidy is replaced with a lump sum transfer.

Table 7: Impact of equivalent increase in income on calorie availability

	Income increase Equivalent to Rice subsidy	Income increase equivalent to Wheat subsidy
Rice subsidy	0.19***	-
	(0.02)	
Cereal price	-1.94	-2.93**
	(1.30)	(1.32)
Total area	-0.00	0.00
	(0.00)	(0.00)
Irrigated area	0.00	0.00
	(0.00)	(0.00)
Household size	0.09***	0.09***
	(0.01)	(0.01)
Proportion of members below age 1 year	0.45**	0.64***
	(0.21)	(0.15)
Proportion of members 1-5 years	0.30***	0.32***
	(0.08)	(0.10)
Proportion of members 5-15 years	0.51***	0.52***
	(0.07)	(0.09)
Proportion of members 15-49 years	0.42***	0.43***
	(0.08)	(0.10)
Proportion of members more than 49 years	0.48***	0.51***
	(0.08)	(0.10)
Cereal production	0.03***	0.04***
	(0.01)	(0.01)
Pulse production	0.02*	0.01
	(0.01)	(0.01)
Wheat subsidy		0.19***
		(0.02)
_cons	11.08***	11.08***
	(0.08)	(0.10)
N	1023.00	810.00

V. Conclusions

This study attempts to examine the impact of the PDS on calorie intakes using ICRISAT's panel data on households. We also aim to explore if the effect of the subsidy is different from that of an increase in income from other sources.

The TPDS has a small impact on poor households in semi-arid areas. Results suggest that in addition to subsidizing food grains, increasing household incomes would increase calorie intakes. Simple comparisons of the subsidy's in-kind transfer with an equivalent increase in household income, indicate that the latter is preferable, a finding supported by microeconomic theory.

However, in the absence of data on cash transfers, we cannot estimate the impacts on household consumption of food and other goods.

Our study suffers from some limitations. First, the impact of cash transfer is indirectly tested. In the absence of data on cash transfer, this is only a preliminary analysis. Second, fixed effects panel data can eliminate endogeneity only if source of endogeneity is unobservable that is time invariant. For other sources of endogeneity, a good instrument will be needed.

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