Food Transfers and Child Nutrition : Evidence from India's Public Distribution System

ONLINE APPENDIX

Aditya Shrinivas, Kathy Baylis, Benjamin Crost*

*Shrinivas: Indian Institute of Management Bangalore (email: aditya.shrinivas@iimb.ac.in); Baylis: University of California Santa Barbara (email: baylis@ucsb.edu); Crost: University of Calgary (email:benjamin.crost@ucalgary.ca)

Appendix Figures

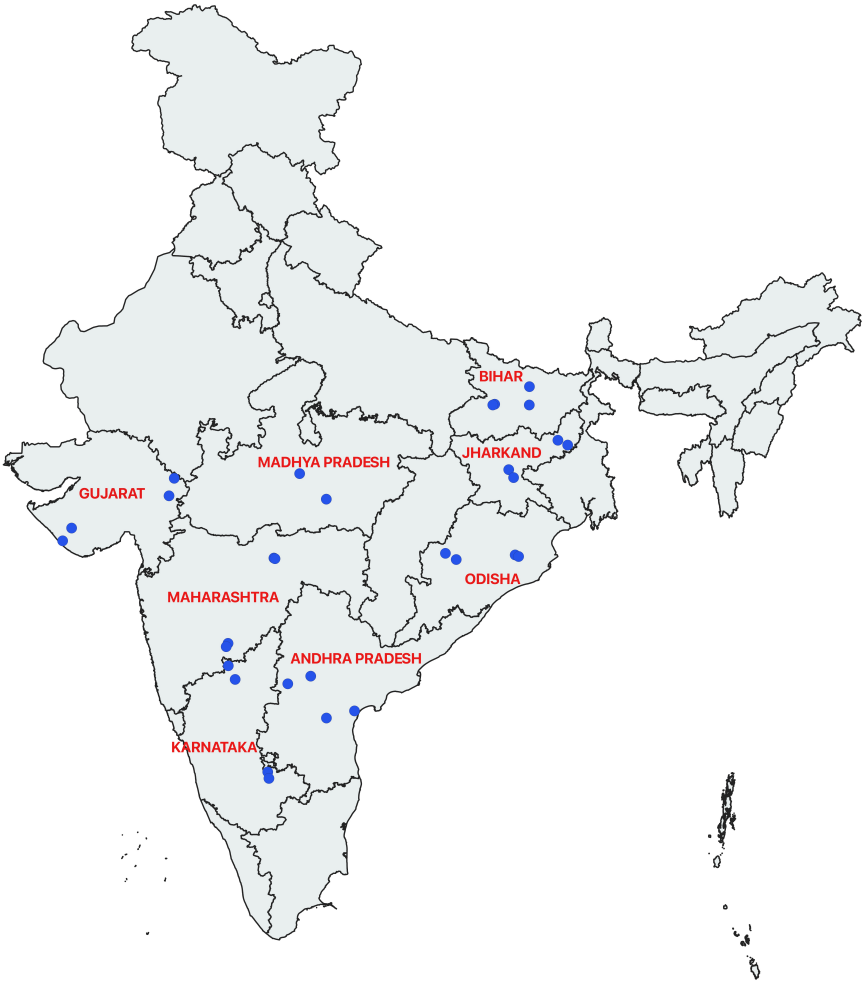

Figure A1: Location of ICRISAT VDSA villages - 30 villages across 8 states in 2010

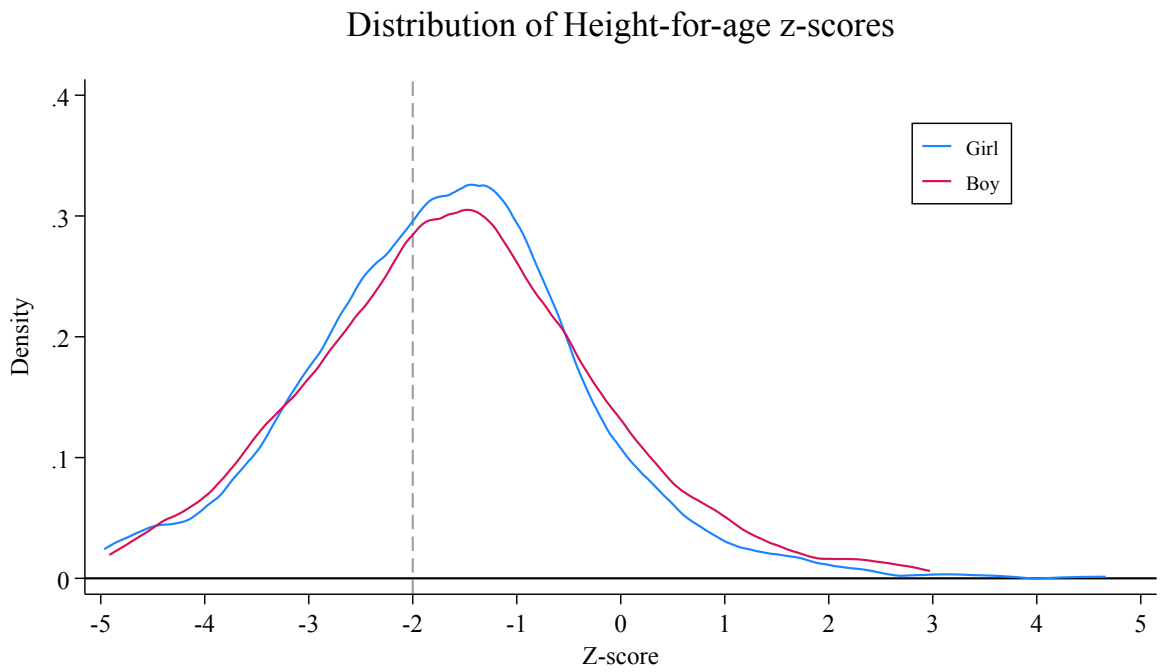

Figure A2: Distribution of height-for-age zscore at baseline

The graph shows the distribution of zscores of height-for-age, based on the WHO 2007 reference population, for girls and boys in the VDSA sample at baseline in 2013

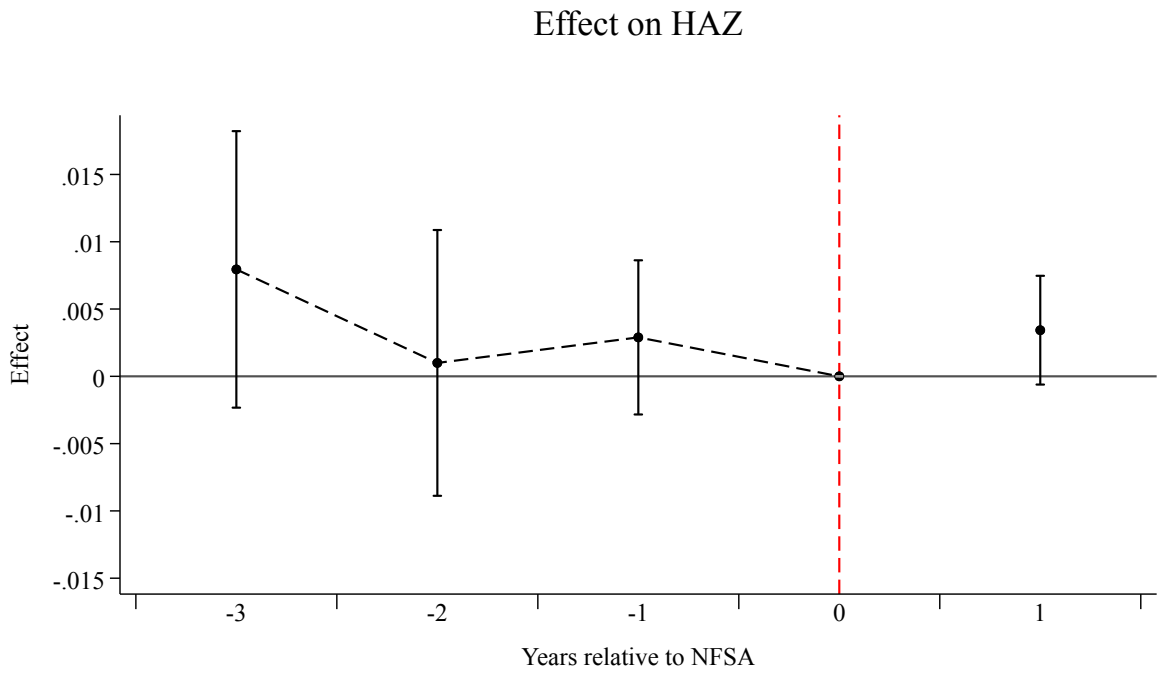

Figure A3: Effect of PDS transfer on HAZ

This graph shows event study coefficients from estimating equation (4) along with their 95% confidence intervals. As described in Section IV.C, equation 4 is a reduced form regression of HAZ on an interaction between treatment intensity ($\Delta\widetilde{T}_{ht}$) and one year time-periods relative to NFSA, with the period of NFSA implementation as the omitted category. The household-specific treatment intensity ($\Delta\widetilde{T}_{ht}$) is the difference between the household's NFSA target value before and after NFSA. Note that this regression is based on the change in the household's transfer target value, $\widetilde{T}_{ht}$ (the instrument used to estimate equation 3), so that the estimates reflect a reduced form effect. The regression includes the same set of controls as our baseline specification : state-by-time fixed effects and a vector of household-specific time varying fixed effects.

Appendix Tables

Table A1: Attrition

	Attrition of individuals	
	Baseline 2013 to 2014	Baseline 2012 to 2014
PDS Transfer value	0.050	0.000
(IV : NFSA target value)	(0.049)	(0.015)
Observations	8053	8712

Notes: This table reports the estimates from a linear probability regression of attrition on PDS transfer value, instrumented by NFSA target value. Attrition is equal to one if the individual is surveyed at baseline, but not after NFSA. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification : state-by-time fixed effects and a vector of household-specific time varying fixed effects. Standard errors in paranthesis are clustered at the village level * p<0.10 ** p<0.05 *** p<0.01.

Table A2: Robustness to village-by-time fixed effects

	Baseline		With village X time FE	
	Stunting	HAZ	Stunting	HAZ
	(1)	(2)	(3)	(4)
PDS Transfer value	-0.216**	0.298*	-0.189**	0.151
(IV : NFSA Target value)	(0.087)	(0.153)	(0.085)	(0.149)
Age # Year FE	X	X	X	X
State # Year FE	X	X	X	X
HH-size # Year FE	X	X	X	X
BPL status # Year FE	X	X	X	X
HH-Char # Year FE	X	X	X	X
Village # Year FE			X	X
Observations	1305	1305	1300	1300

Notes: The table presents the robustness of the main results on stunting to village-by-time fixed effects. Columns (1) and (2) present the baseline estimates of IV regression of stunting and height-for-age zscore (PDS) on PDS transfer value, instrumented by NFSA target value. Columns (3) and (4) further control for village-by-time FE. Unit of observation is individual-year. PDS transfer value and NFSA target value are expressed in units of 100 rupees. All regressions include individual and consecutive year fixed effect. Stunting=1 if $HAZ < -2$. Standard errors reported in parenthesis are clustered at village level. *p<0.10 ** p<0.05 *** p<0.01.

Table A3: Effect of PDS transfer on child stunting (reduced form)

	Stunting	HAZ
PDS Transfer value	-0.195**	0.269*
(IV : NFSA Target value)	(0.076)	(0.139)
Age # Year FE	X	X
State # Year FE	X	X
HH-size group # Year FE	X	X
BPL status # Year FE	X	X
HH-Char # Year FE	X	X
Observations	1305	1305

Notes: The table presents reduced form regressions of stunting and HAZ on the instrument - NFSA target value. PDS transfer value and NFSA target value are expressed in units of 100 rupees. Unit of observation is individual-year. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects. Stunting=1 if $HAZ < -2$. HAZ is winsorized at the top and bottom 2.5% of the distribution to remove outliers that may be due to misreporting. Standard errors reported in parenthesis are clustered at village level. *p<0.10 ** p<0.05 *** p<0.01.

Table A4: Effect of PDS transfer on children height by gender

	Stunting	HAZ
PDS transfer (IV: NFSA target value)		
X Girl	-0.190**	0.252
	(0.076)	(0.164)
X Boy	-0.422	0.665
	(0.284)	(0.484)
Observations	1305	1305
Effect size : Girl - Boy	0.231	-0.413
H_0: Girl = Boy (p-value)	0.38	0.43

Notes: The table presents heterogeneous effects by gender from IV regressions of individual stunting and HAZ on PDS transfer value, instrumented by NFSA target value, interacted with gender. The estimation includes children ages 0 to 5 years. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (3). The unit of observation is the individual-year. Stunting=1 if $HAZ < -2$. At the bottom of the table, effect size represents the difference between the co-efficient estimate on girls and boys, and the p-value of the hypothesis test that the difference in coefficient estimates is equal to zero. Standard errors reported in parenthesis are clustered at village level. *p<0.10 ** p<0.05 *** p<0.01.

Table A5: Heterogeneous effects on stunting by landholding status

	Stunting	
	(1)	(2)
PDS Transfer value	-0.216**	
(IV : NFSA Target value)	(0.087)	
Heterogeneity by Landholding		
Bottom two quintiles		-0.252**
		(0.092)
Top two quintiles		-0.007
		(0.152)
Observations	1305	1305

Notes: Column (1) reports the baseline effects and Column (2) reports heterogeneous effects of PDS transfers on stunting by land-holding holding status pre-NFSA. The co-efficient estimates are from instrumented regressions of stunting and HAZ on PDS transfer value, with NFSA target vale as the instrument. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (3). Standard errors in paranthesis are clustered at the village level * p<0.10 ** p<0.05 *** p<0.01.

Table A6: Effect on older children anthropometrics (Ages 6 to 19)

	Stunting	Log of weight	Underweight	BMI	Log of MUAC
PDS transfer (IV: NFSA Target value)					
X Middle childhood (6-10)	-0.064	0.020	-0.033	-0.047	0.029*
	(0.069)	(0.017)	(0.059)	(0.227)	(0.016)
X Adolescents (11-19)	-0.036	0.019		0.221	0.012
	(0.065)	(0.015)		(0.243)	(0.017)
Observations	5148	5221	1821	5191	5220

Notes: This table presents coefficients and standard errors from instrumented regression of PDS transfer value, with NFSA target value as the instrument, for older children aged 6 to 19 years. PDS transfer value and NFSA target value are expressed in units of 100 rupees. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (3). Standard errors reported in parenthesis are clustered at village level. *p<0.10 ** p<0.05 *** p<0.01.

Table A7: Robustness to controlling for NREGA variables

	Stunting				
PDS Transfer value	-0.216**	-0.211**	-0.213**	-0.213**	-0.215**
(IV NFSA Target value)	(0.087)	(0.087)	(0.088)	(0.088)	(0.087)
NREGA controls X BPL status					
Fiscal expenditures		X	X	X	X
Funds allocated from center to state			X	X	X
Number of HHs provided employement				X	X
Number of person days					X
Observations	1305	1305	1305	1305	1305

Notes: This table shows the effect of PDS transfers on child and adolescent stunting, controlling for NREGA variables interacted with ration card status of household. Each column is from a separate regression. PDS transfer value and NFSA target value are expressed in units of 100 rupees. BPL status refers to the PDS ration card status of the household equal to 1 if the ration card status is AAY or BPL, and zero if APL or no card. All regressions include individual and consecutive year fixed effects and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (3). Data on NREGA budget allocation and implementation comes from Ministry of Rural Development, Government of India and the Statistical year book, published by the Ministry of Statistics and Program Implementation (Statistical Year Book India, 2013, 2014, 2015). Standard errors in parenthesis are clustered at village level. * p<0.10 ** p<0.05 *** p<0.01.

Table A8: Association of PDS transfers with other social welfare programs

	Mid-day meals	NREGA income	Public health insurance	Scholarships and Relief
PDS Transfer value	0.002	0.041	0.020	0.175
(IV NFSA Target value)	(0.017)	(0.059)	(0.035)	(0.133)
Observations	45758	48014	45758	45758

Notes: This table presents coefficient estimates from instrumented regressions of PDS transfer value, with NFSA target value as the instrument, on benefits received from other social welfare programs. Data on the receipt of social welfare programs is available only for the 18 Semi-Arid Tropic villages in the ICRISAT data. The unit of observation is the household-month. All regressions include household and consecutive month fixed effects. Standard errors clustered at the village level in parenthesis. * p<0.10 ** p<0.05 *** p<0.01.

Table A9: Effect of PDS transfer on food budget shares

	Animal Proteins	Cereals	Fruits and Veg.	Oils
PDS Transfer value	0.014**	-0.037***	0.003	0.003
(IV : NFSA Target value)	(0.006)	(0.006)	(0.007)	(0.003)
Observations	31988	31859	31988	31524
Baseline mean (in %)	19.3	19.5	14.8	8.7
Change from PDS expansion (in levels)	0.406	1.111		
Change from PDS expansion (in %)	2.1%	5.7%		

Notes: This table presents coefficients and standard errors from instrumented regression of household food budget shares on PDS transfer value, with NFSA target value as the instrument. Unit of observation is household-month. All regressions include household and consecutive month fixed effects, and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (5). Sample is restricted to households with children aged 0 to 5 years. Standard errors reported in parenthesis are clustered at village level *p<0.10 ** p<0.05 *** p<0.01.

Table A10: Elasticities of calorie protein and fat intake of PDS benefeciaries

	Log of Calories	Log of Protein	Log of Fat
Panel A : PDS transfer elasticity			
Log of PDS Transfer value	0.265***	0.278***	0.339***
(IV : Log of NFSA Target value)	(0.054)	(0.054)	(0.071)
Observations	42964	42946	43022
Panel B : Expenditure elasticity			
Log of total expenditure value	0.268***	0.287***	0.367***
	(0.017)	(0.017)	(0.023)
Observations	42180	42166	42258

Notes: This table presents elasticity estimates with respect to PDS transfer in Panel A and total expenditures in Panel B. Each co-efficient estimate is obtained from a separate regression in log-log form. Therefore, the sample is restricted to beneficiary households with a non-zero PDS transfer value. Panel A presents instrumented regressions on log of PDS transfer value, with log of NFSA target value as the instrument. Unit of observation is household-month. All regressions include household and consecutive month fixed effects, and the same set of controls as our baseline specification: state-by-time fixed effects and a vector of household-specific time varying fixed effects, as specified in equation (5). Standard errors reported in parenthesis are clustered at village level *p<0.10 ** p<0.05 *** p<0.01.

Appendix A1: Effect on prices

It is possible that the expansion of PDS transfers may decrease local market prices of rice and wheat, since PDS and non-PDS rice and wheat are close substitutes. Previous studies in a different context have shown that, relative to cash transfers, an expansion of food transfers can lead to lower local consumer prices (Cunha et al., 2018). To examine this possibility, we estimate price effects of PDS transfers at the village-level. Following a similar approach as Cunha et al. (2018), we use the first difference of prices as the outcome variable to deal with autocorrelation in prices:[1]

$$\Delta P_{vsyt} = \beta_3 \overline{T}_{vsyt} + \delta_{sy} + \alpha_v + \lambda_t + \epsilon_{vsyt} \quad (1)$$

where ΔP_{vsyt} is the first difference in log prices of rice and wheat in village v, state s and month t. The subscript y denotes the year, while the subscript t denotes the consecutive month, i.e. the month-year. Variable T_{vsyt} is the village average PDS transfer value, and α_v and λ_t are village and consecutive month fixed effects. As before, the village average PDS transfer value $\overline{T}_{vsyt}$ is instrumented with the village average target value based on the NFSA mandates, $\overline{\widetilde{T}}_{vsyt}$. As before, our baseline specification includes state-by-year fixed effects δ_{sy} that eliminate all cross-state variation in the expansion of PDS after the NFSA. Therefore, the identification of the village-level estimates are based on comparison of villages observed in the same state and year whose village aggregate PDS transfers were affected to different extents by the NFSA.

The results in Table A11 provide no evidence that PDS transfers affected local market prices. Although the co-efficients on rice and wheat prices are negative, they are statistically indistinguishable from zero with large confidence intervals, most likely resulting from a lack of statistical power.[2] Based on the coefficient estimates in Column (1), for a 10 rupee per capita increase in the village average transfer value (equivalent to the PDS expansion for an average village in our data), the associated 95% CI for the percentage change in prices ranges from -1.6% to 0.6%. Furthermore, Column (2) reports the heterogeneous price effects based on the degree of market integration in each village. Following Cunha et al. (2018), we construct a measure of market integration for each village by measuring how correlated the village prices are with Indian national retail prices for the same good in the same month. The results in Column (2) suggest that the magnitude of the price effects seem to be larger for more isolated markets (below median correlation) that are not strongly correlated with Indian national prices. In conclusion, while we find no evidence of reductions in local market prices of rice and wheat, our analysis is likely not powered to detect effects of small to moderate size due to the limited amount of cross-village variation in average PDS transfers.

[1] Cunha et al. (2018) control for baseline prices in a cross-sectional regression on prices in levels and also show results for first difference in prices. In our case, the village panel data on prices has a long time-series component of up to 60 observations for each village, and therefore price outcomes in levels may be auto-correlated. To examine the time-series properties, we tested for the presence of unit roots in these price series. For the price series in levels, a standard Dickey-Fuller test failed to reject the null hypothesis of a unit root implying that autocorrelations in price levels may be close to one. However, for the price series in first differences, the test rejected the null hypothesis of unit root at the 1% significance level. Therefore, we consider the first difference in prices and interpret the price effects in terms of monthly price changes.

[2] There is much less variation in PDS transfers at the village level than at the household level, which susbtantially reduces our statistical power to detect a village-level effect.

Table A11: Effect of PDS transfer on local prices

	Outcome = Market prices in first difference log * 100			
	Rice and wheat		Rice	Wheat
	(1)	(2)	(4)	(5)
Average effects				
Village avg transfer value	-0.047		-0.097	0.012
(IV : Village avg target value)	(0.054)		(0.068)	(0.058)
Heterogeneity by Price Integration				
Below Median X PDS Transfer		-0.078		
		(0.065)		
Above Median X PDS Transfer		-0.013		
		(0.034)		
Observations	1731	1731	1587	1486
Effect size : Below Median - Above median		-0.065		
		(0.064)		
H_0 : Below median = Above median (p-value)		0.311		

Notes: This table presents coefficient and standard errors from instrumented regressions of village market prices of rice and wheat on village average PDS transfer value, with village average NFSA target value as the instrument. Price outcomes are in first difference in log units. For ease of interpretation, log units are multiplied by 100. Unit of observation in village-month. All regressions include village and consecutive month fixed effects and state-specific year fixed effects. Price data come from the Price Schedule in the ICRISAT data and correspond to a comparable variety of PDS rice and wheat. In Column (2) price integration refers to the magnitude of correlation between village prices and Indian national retail prices. Indian retail prices were obtained from the Department of Consumer Affairs, Government of India (MCA, 2015). Standard errors clustered at the village level in parenthesis. * p<0.10 ** p<0.05 *** p<0.01.

References

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