The Impact of Covid-19 on Household Consumption Expenditure in India

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Abstract

The Covid-19 pandemic caused major disruption in the economy in India in an unprecedented manner. A year into the pandemic, the economic stress continued to have a rippling effect, leaving workers in the lurch, particularly those engaged in informal employment. We use granular data from two rounds of the household survey of the Delhi Metropolitan Area Study to examine changes in per-capita consumption expenditure between 2019 and 2021. Results suggest that on average, per-capita consumption dropped, although the drop was primarily driven by discretionary purchases. Results also suggest that households were able to smooth their food consumption expenditure, particularly for cereals such as rice and wheat, along with cereal complements, such as vegetables, pulses, and other items that are taken together with cereals. The anchoring of such food items was backed by the additional food grains subsidy extended by the government through the public distribution system (PDS) during the pandemic. This is particularly evident amongst households deriving their primary source of income from daily wage labor once food items are re-estimated to take into account the value of subsidy received.

Key words: Covid-19, consumption expenditure, food subsidy, food groups, income groups

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1. Introduction

The COVID-19 pandemic led to severe restrictions in the earnings capacity in people in India as the economy meandered across alternating lockdown and unlocking phases, tied to the first and second waves on infection in 2020 and 2021 respectively. Apart from the catastrophic effect of the virus on public health, the pandemic wreaked havoc on livelihoods and food security through disruptions in the supply chains and economic activities, particularly during the early lockdown phase. Some of these effects continued to ripple through, even when mobility restrictions were gradually lifted. Not surprisingly, strong support for the lockdown dissipated over time, with individuals who experienced large income decline less supportive of lockdowns.

Using data from rapid assessment telephone surveys, in the Delhi NCR, (Choudhuri, Pramanik et al. 2022) show that nearly 80 percent of the sample households reported suffering income losses between April to May 2020 following the announcement of the nation-wide lockdown by the Indian government, with more than 50 percent suffering from severe loss in income. While a high proportion of households benefitted from government welfare transfers, the authors find that approximately 27 percent of the sample households surveyed reported that they needed access to subsidized food grains but did not have access to it, with urban informal workers more affected than their rural counterparts. More than a year into the pandemic since the first lockdown that came into effect in March 2020, and beyond the peak of the second wave in 2021, how were households coping? Did access to food subsidy improve? How did this affect food basket composition? We unpack data from the two rounds of face-to-face household survey data, from the Delhi Metropolitan Area Study (DMAS), to examine the how households coped, by looking at alternate measures of household consumption expenditure, and shifts in the food basket. The Baseline DMAS survey was conducted in February to May 2019, using Computer-Assisted-Personal-Interview (CAPI) method. These households were re-interviewed for the Endline survey that was conducted from August to October 2021. This provides us a unique opportunity to examine the coping mechanisms adopted by a matched panel of 4,292 households in the Delhi National Capital Region (NCR) in response to the exogenous shock ensuing from the pandemic.

Following the announcement of the lockdown in March 2020, the Central government quickly stepped in by extending five kg additional food grains to allay fears of food insecurity as supply-chain network chocked across the country due to a near freezing of transportation and logistics. The additional food

grains subsidy was to be distributed through the public distribution system (PDS) under the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY). The government also relaxed lockdown in the rural sector in April 2020 to ward off any impending fears of food shortage so that farmers can continue to engage in agricultural activities. As the pandemic continued to rage for much of 2020, and with a second more infectious delta wave peaking in India during the first half of 2021, the food grains subsidy was extended well into 2021, and overlapped into the 2021 DMAS Endline survey. This allows us to capture how the subsidy may have affected household consumption basket using data from 2019 and 2021,

Households in both developed and developing countries tend to adopt a range of coping mechanisms to smooth their consumption when faced with idiosyncratic shocks to their income (Cochrane 1991, Morduch 1995, Dercon 2002). Conventional mechanisms adopted by households to smooth consumption, such as informal risk sharing (Townsend 1994, Udry 1994, Chiappori, Samphantharak et al. 2014), sale of assets (Deaton 1991), labor supply increase or borrowing (Maitra 2001, Cameron and Worswick 2003), may not work in the event of a dramatic aggregate shock (McKenzie 2003). Examining the Mexican Peso crisis, McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003)McKenzie (2003) and (McKenzie 2006) found evidence that, in response to the aggregate shock, households increased their budget share of food items, while curtailing consumption of durable goods and health expenditure. Such shifts in budget share of food items in response to large scale shock have been documented in other studies also (Thomas and Frankenberg 2007, Stillman and Thomas 2008).

Our paper contributes to the growing literature on the effect of Covid-19 crisis on household wellbeing. The pandemic took a particularly harsh toll on the urban poor in India, especially the urban informal workers (Afridi, Dhillon et al. 2020, Dhingra and Machin 2020, Kesar, Abraham et al. 2020, Basole, Abraham et al. 2021, Choudhuri, Pramanik et al. 2022)], along with evidence that while employment fell for both men and women in the early days of the pandemic, the fall was higher for men than women (Deshpande 2020, Desai, Deshmukh et al. 2021). Studies have also found evidence of fall in food expenditure (Gupta, Malani et al. 2021) resulting in a surge in food insecurity (Drèze and Somanchi 2021, Mishra, Madan et al. 2021, Kumar and Sonkar 2022), with such hardships often lasting well beyond the initial lockdown, into October – December 2020 (Drèze and Somanchi 2021). (Gupta, Seth et al. 2022) also find a fall in consumption of non-staple items in

May 2020, such as meats, eggs, vegetables and fruits, with women disproportionately affected by lack of dietary diversity.

In comparison to earlier studies, our paper delves into household status well into the pandemic, and past the second Covid-19 peak. Our data allows us to examine the role played by additional food subsidies in changing the composition of the food basket during the pandemic, distinguishing between food groups that can be considered as complementary to cereal consumption and those that can be considered as substitutes. We adopt the definition of cereal complements and substitutes from (Desai and Iyer 2016), which is explained in greater detail in Section 3. Our paper thus also contributes to the literature on how households cope in response to a major shock, and the insurance provided by government food grains subsidies that may have aided households weather the storm stoked up by the pandemic.

Experience of household distress, stemming from lockdown induced mobility restriction is not limited to India, and multiple studies have documented increased economic distress in several countries across the world, resulting in fall in food expenditure and an increased likelihood of hunger (Hirvonen, De Brauw et al. 2021, Mahmud and Riley 2021) (Amare, Abay et al. 2021),(Josephson, Kilic et al. 2021),(Egger, Miguel et al. 2021),(Kim, Koh et al. 2022). However, several others have noted the absence of one to one correspondence between income and consumption decline. Despite large fall in income in rural Liberia and Malawi, (Aggarwal, Jeong et al. 2020) find no evidence of food insecurity. On the contrary, the authors find that cash transfers extended during the pandemic improved dietary quality over the baseline levels. For instance, Hirvonen, De Brauw et al. (2021), found that for households in Addis Ababa, the capital of Ethiopia, household dietary diversity and food consumption remained fairly stable during the pandemic, despite reports of fall in income and job loss.

Overall, when left without alternate resource, in the event of a catastrophic aggregate shock, households may resort to making adjustments in their overall consumption expenditure by cutting down on their discretionary purchases. Further, households with access to food subsidies program may be better equipped to anchor their food consumption..

In particular, we seek responses to the following set of research questions:

a. How well did households smooth their consumption expenditure in response to the Covid-19 pandemic? Is the ability to smooth consumption dependent on

sources of income, with households engaged in informal employment worse off than others? How does this differ across food and non-food expenditures?

b. What is the effect of food subsidy on the change in consumption expenditure on other items in the food basket and how does this differ across households?

Results from a matched panel of households surveyed indicate substantial drop in real per-capita consumption expenditure between 2019 and 2021. The drop in consumption was primarily driven by a fall in expenditure on discretionary items such as durable goods, clothing, appliances, while food expenses remained anchored backed by government subsidies. Our analysis also show an increase in food items, such as vegetables and proteins, that can be considered as complements to food grains, which is likely to have been the result of increased available of grains. However, consumption of cereal substitutes such as dairy items or fruits fell.

The rest of the paper is organized as follows. Section 2 discusses the data. Section 3 presents the alternate measures and subsets of consumption expenditure that we use to examine household welfare status. Section 4 discusses the descriptive statistics. Section 5 presents the results. Section 7 concludes.

2. Data: Delhi Metropolitan Area Study

The baseline survey of the Delhi Metropolitan Area Study was launched in 2019, covering 5250 households from the Delhi NCR region. This sample covers a total of 31 districts and 270 primary sampling units (PSUs) across the three states of Haryana, Rajasthan, Uttar Pradesh, and the Union Territory of Delhi. The households in the sample were selected using a three-stage stratified cluster sampling design, with a representative random sample selected at each stage[1]. The baseline survey was conducted between February to April 2019. These households were revisited again during the endline survey, launched in August 2021, with re-contact rate of 82 percent. The survey provides a wealth of information on sources of income, consumption expenditure, and health status of the sample households. The income and the consumption questionnaire of the DMAS baseline and endline surveys were designed based on the Indian Human Development Survey (IHDS) (Desai and Vanneman 2010). The results from this current study is based on a panel sample of 4,292 households, from PSUs located in the Delhi NCR.

[1] The detailed sampling methodology adopted is available on request.

3. Changes in consumption expenditure

3.1 Consumption items:

We use per capital annual household consumption expenditure to measure economic status. Within consumption expenditure, we separately examine changes in food expenditure, non-food expenditure, and expenditure on discretionary items. We use two alternate measures of food expenditure:

1) In the first scenario, we use prices at which the consumers purchased the respective food items. This includes heavily subsidized prices of food grains (rice and wheat) bought from the fair price shops.
2) In the second scenario, we re-estimate the value of subsidized food grains at the prevailing market prices recorded by the household. The second method allows us to compute the value of the subsidy that the household availed each month for their food grains consumption. To be precise, the subsidy value can be treated as the difference between the prevailing market price and the recorded PDS (subsidized) purchase price.

The consumption variable is constructed from a set of 33 categories with a recall period over the previous 30 days, and another 19 categories that are reported with a recall period for the 365 days:

a. food items with 30 days recall period,
b. non-food items that are purchased frequently, with 30 days recall period
c. non-food items (such as durable goods, school fees, repair and maintenance, etc.) that are purchased infrequently, with 365 days recall period.

To examine households of which demographic characteristics were more affected than others, and their coping mechanisms, and whether households were engaged in consumption smoothing, we are estimate the following equation using the method adopted by Cochrane (1991), (Townsend 1994) , and (Baker 2018), whereby we examine the change in per capita household consumption expenditure between 2019 and 2021. More specifically our paper looks at whether the food subsidy program extended by the government offered a formal insurance mechanism to smooth consumption, and which income group (based on principal source of household income) were better able to do so.

3.2 Alternate measures:

We examine changes consumption expenditure over the following categories: (i) total annual per capita expenditure (at purchase price), (ii) total annual per capita expenditure (estimated at market price), (iii) food expenditure (at purchase price), (iv) food expenditure (at market price), (v) non-food necessities, (vi) discretionary items. We also estimate changes in quantity of food grains purchased. The first measure captures food grains purchased from both the market and the PDS shop. The second measure captures purchase from PDS shop. This captures the direct effect of the subsidy extended by the government, in terms of increased allocation of rice or wheat for each household during the pandemic.

Additionally, we also look at food groups that can be considered cereal complements and cereal substitutes to starchy cereals such as rice and wheat. Following Desai and Iyer (2016), we consider vegetables, pulses, meat, eggs as cereal complements, and dairy products and fruits as cereal substitutes. Indian diets in most parts of the country tend to be carbohydrate rich. As Desai and Iyer (2016) pointed out, heavily subsidized food grains, such as rice and wheat, extended through the PDS fair price shops, reinforce carbohydrate consumption.

Following Baker (2018), we estimate the following equation measuring the effect of change in log income on the change in log consumption, after controlling for socio-economic and demographic controls.

$$\log\left(\frac{C_{i,t}}{C}_{i,t-1}\right) = \partial_0 + \partial_1 \log\left(\frac{Y_{i,t}}{Y}_{i,t-1}\right) + \partial_2 X_i + \varepsilon_1 \quad -(1)$$

where $\log\left(\frac{C_{i,t}}{C}_{i,t-1}\right)$ captures the change in per capita annual consumption in household *i* between period t and t-1.- this can also be written as $\Delta c_t = c_t - c_{t-1}$, where c_t = log(C_t) . All consumption figures are reported in real terms, adjusted for 2019 prices, using monthly consumer price index (CPI), across states and sector (rural versus urban). Y_i represents per capita current income. ∂_1 provides an estimate an estimate of the elasticity of consumption with respect to income.

X_i represents the range of socio-demographic covariates at the household level that can affect household economic status:

a) principal source of income prior to the pandemic (2019), 5 categories: (i) agriculture and allied activities, (ii) household business, (iii) daily wage work, (iv) salaried work, (v) non-labor income;
b) whether the household consumed food from own production. This comprises of production in agricultural farm or animal farm.
c) household reporting income loss, 3 categories: (i) loss suffered due to job loss, reduction in wage, insufficient work, business closure or reduction in sales, insufficient price for agricultural produce, reduction in remittances, etc. (ii) loss suffered due to lack of mobility, (iii) no loss suffered;
d) whether the household holds below poverty line (BPL[2]) identification card, 3 categories: (i) yes, (ii) no, APL (above poverty line), and (iii) no, don't have / applied but not received card.
e) highest level of educational attainment in the household, 5 categories: up to primary, middle school, at least secondary education, at least higher secondary education, some college degree and above;
f) household composition: household size and share of dependents in the household (ratio of children and elderly to total household members);
g) caste and religion: (i) Forward caste (including Brahmins), Other Backward Communities, and Schedules Castes / Tribes amongst Hindus, (ii) Muslims, (iii) Christian, Jains, Buddhists;
h) household assets quintile;
i) urban versus rural, and
j) state dummies.

β_0, β_1, β_2, ∂_0, ∂_1, and ∂_2 are parameters to be estimated. Equation (1) is estimated using ordinary least square (OLS) estimation method. Standard errors are clustered at the PSU level.

4. Descriptive Statistics

4.1 Baseline occupational categories:

Data from the 2019 baseline survey indicates that 29 percent of the 5255 sample households drew their income from agricultural and allied activities, while 28.9 percent reported own businesses.

[2] Approximately 0.08 percent of the total sample held Annapurna card (meant for those aged 65 years and above and living below poverty line), while 0.68 percent of the sample held Antodaya Anna Yojana (AAY) card meant for the poorest of the poor. These have been clubbed with BPL cards.

Approximately 68.6 percent of sample households derived income from wage and salaried work – while 11 and 21 percent of households were engaged in agricultural and non-agricultural wage work respectively, around 49.86 percent were employed in regular salaried jobs. Amongst those earning from salaried work, only 19 percent were engaged in formal employment, and were registered with employment linked provident fund (PF), while only five percent received social security benefits. Majority of the households reporting income from agricultural and non-agricultural wage work, 62.5 and 49 percent respectively, were concentrated in the poorest asset quintile. Salaried households, on the other hand, were primarily concentrated in the middle and the fourth quintile at 28.2 and 21.5 percent respectively.

4.2 Economics status: comparisons with endline survey

Using a matched panel of 4,292 households, we observe drop in real per-capita total consumption expenditure by approximately 3.8 percent annually across the two rounds (see Table 1). Looking at consumption items, the drop is higher (12 percent) for discretionary items such as clothing, appliances, school fees – these were canvassed with a recall period of 365 days items. In comparison, the drop is only marginal for frequently purchased non-food items by 1.2 percent. Expenditure on food items at purchase prices[3], adjusted by CPI, increased marginally by 1.5 percent) backed by PDS subsidies extended by the government. Real food expenses, recalculated using market prices, increased by around 2 percent annually. Food and non-food items were both captured with a 30 day recall period.

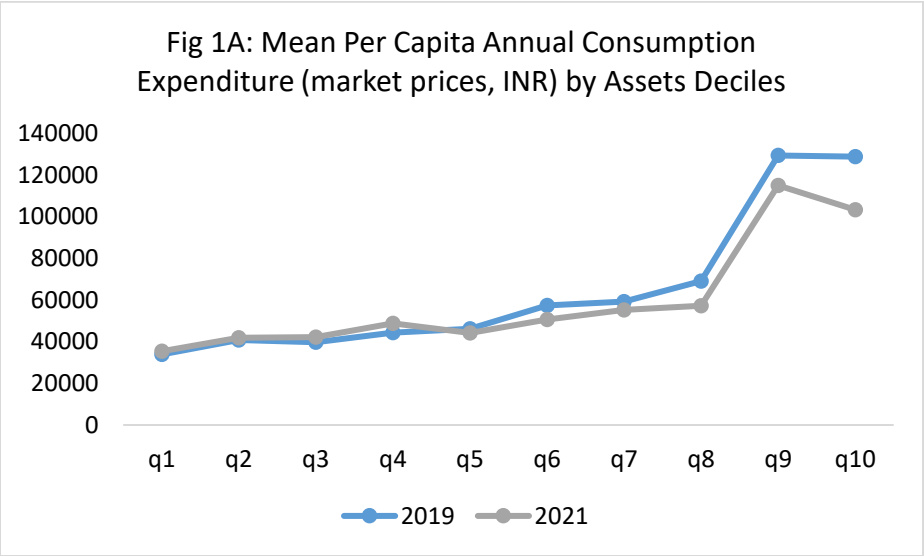
Table 1: Average Real Per-Capita Consumption Expenditure in 2019 and 2021 (in INR)

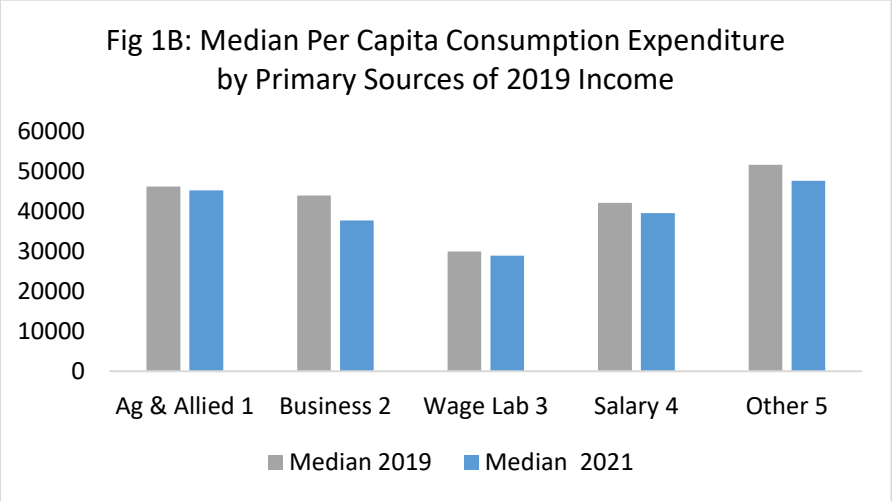
	2019	2021	2019	2021
	Purchase price		Market price	
Per capita annual consumption expenditure	56,583	52,319	57,187	53,187
	(72,244)	(69,566)	(72,166)	(69,462)
Per capita food expenditure (annualized)	19,294	19,870	19,896	20,726
(frequently purchased, 30 day recall)	(10,020)	(13,255)	(9,942)	(13,218)
Per capita non-food expenditure (annualized)	15,783	15,392	-	-
(frequently purchased, 30 day recall)	(18,752)	(13,138)		
Per capita expenditure on discretionary items	19,880	15,413	-	-
(infrequently purchased, 365 day recall)	(55,757)	(58,719)		
Total Matched Sample	4,292			

Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey (February 2019 – June 2019) and endline survey (August 2021 – Sept 2021).
Note: Figures in parentheses reflect standard deviation. All 2021 figures have been adjusted for 2019 prices, using monthly consumer price index, by state and sector (urban vs rural). All figures reflect annual weighted estimates.

[3] This includes subsidized value of food grains obtained from the fair price PDS shops.

Figure 1A and 1B: Per-Capita Real Annual Consumption Expenditure (market prices)





Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey and endline survey.
Note: All 2021 figures have been adjusted for 2019 prices, using monthly consumer price index, by state and sector (urban vs rural). q1-q10 represent the assets deciles constructed using consumer goods and housing quality. Figures represent annual weighted estimates.

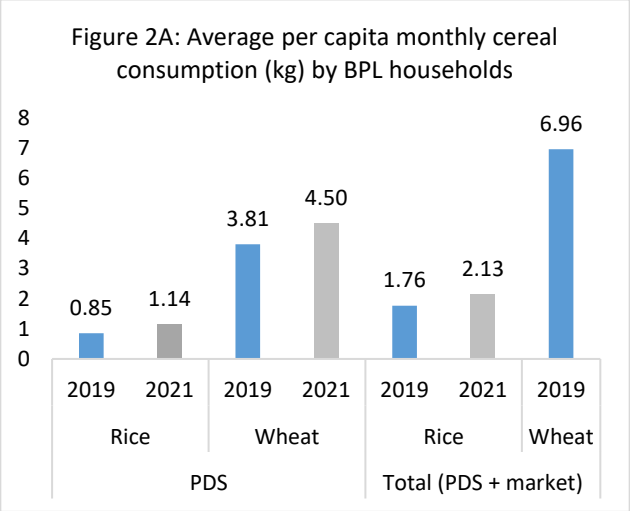
Figure 1 plots consumption expenditure for the median household ranked by household assets deciles. Figure 1 shows that the mean household in the poorest deciles were mostly unaffected from the exogenous shock – the poorer households need to maintain a minimum subsistence level of consumption, while the drop in the top decile classes may reflect drop in discretionary purchases in response to the pandemic. For a more disaggregated picture, using pre-pandemic (2019) principal source of income to identify broad occupational patterns, we observe in Figure 1B drop in per-capita annual consumption expenditure considerably higher for those reporting

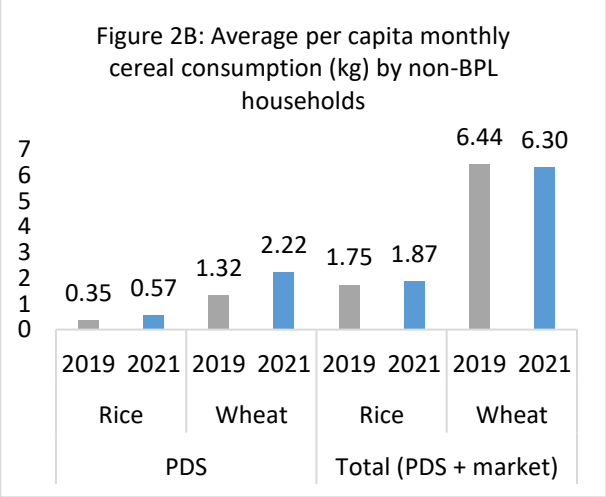
salaried and business income, along with non-labor income (other sources). The drop in per-capita consumption expenditure of households reporting daily wage laborer was relatively lower compared to other groups, but important to note the low levels of consumption expenditure for these households, which is likely to reflect pre-existing precarity stemming from the irregular sources of income coupled with lack of access to social security benefits.

4.3 Food subsidy

While per capita consumption expenditure dropped overall, the fall was primarily driven by reductions in discretionary purchases as shown in Table 1. On the other hand, food consumption expenditure was relatively more anchored, backed by a massive subsidy program extended by the government, for both poor and non-poor households alike. This may also explain why we observe relatively steady levels of consumption expenditure amongst poorer households, such as those drawing their primary sources of income from casual wage labor.

Figure 2A and 2B: Average Per Capita Monthly Consumption of Food Grains (rice and wheat)





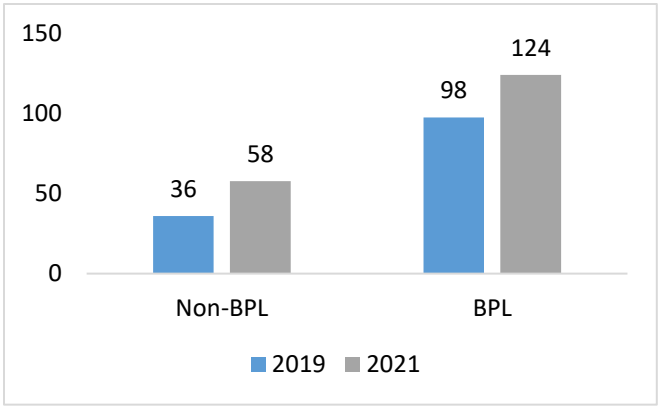
Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey (February 2019 – June 2019) and endline survey (August 2021 – Sept 2021). All figures reflect weighted estimates.

In March 2020, the government had extended five kg additional food grains (rice and wheat) to be distributed through the public distribution system (PDS), which was later extended well into 2021. More detailed results from the household food basket show that per capita monthly consumption of rice and wheat changed from 1.75 kg and 6.54 kg per person in the pre-

pandemic period (2019) to 1.92 kg and 6.37 kg per person, respectively, in 2021[4]. During usual times, richer households tend to buy higher quality grains from the market.

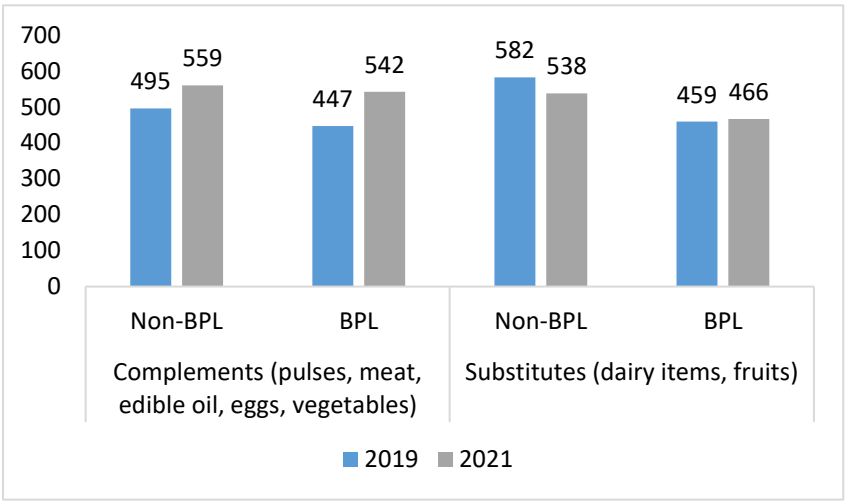
But as the government extended food grains subsidy regardless of BPL status, both BPL and non-BPL households increasingly shifted to PDS grains, which helped smooth food consumption despite economic stress. Per capita monthly purchase of wheat (the staple food grains in the region) from PDS increased by about 0.69 kilogram (kg) for the below poverty line (BPL) card holders and by 0.9 kg for the non-BPL households (see Figures 2A and 2B).

Figure 2C: Average Montly Value of Per Capita Subsidy of Food Grains (rice and wheat)



Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey (February 2019 – June 2019) and endline survey (August 2021 – Sept 2021). Estimates are adjusted for 2019 prices to reflect real values. All figures are weighted estimates.

Figure 2D: Cereal Substitutes and Cereal Complements



Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey (February 2019 – June 2019) and endline survey (August 2021 – Sept 2021). Estimates are adjusted for 2019 prices.

Around 52 percent of the households in the sample bought food grains (rice or wheat) from PDS shops in 2019, increasing to 60 percent in 2021. Of these around 31 percent were BPL card

[4] These figures reflect weighted estimates.

holders as of 2021, indicating how those above the poverty line also benefitted from the food subsidies program. Overall 71 percent of the sample held food ration cards (BPL and APL (above poverty line) cards) as of 2019.

While the results do not show prevalence of wide-spread starvation, it needs to be noted the Delhi NCR is privileged and its results are selective. The results show that households were able to sustain their food consumption because of access to subsidies. We also observe that the subsidies remained largely pro-poor, with the total value of monthly per capita subsidies for BPL families substantially higher (see Figure 2C), and benefitted those more affected by the pandemic. Using 2021 data from the DMAS, we observe that nearly 76.6 percent of households that drew their income from daily wage labor received PDS subsidies, while 60 percent of those with micro and small businesses did so. The relatively smaller percentage of exclusion could have stemmed from a variety of issues – from non-availability of ration, if members suffered from health issues during the pandemic, or if mobility restrictions prevented them from travelling to PDS shops, or if migrant households did not have valid ration cards.

5 Results

5.1 Changes in per capita real expenditures

In this section we present the results from estimating equation (1) for different groups of consumption items. Columns I through 4 in Table 2 relate to changes in various categories of real per-capita expenditure between 2019 and 2021. For columns (1) and (2), food grains obtained from fair price (PDS) shops at subsidized prices have been recalculated at current market prices (as recorded by the households) – this also allowed us to calculate the value of food subsidy received across rounds. Columns (1) and (1A) signify the broad aggregate per capita consumption expenditure, while columns (2) – (4) show the sub-aggregates. Note that the recorded purchase price is relevant for items bought from fair price (food ration) shops only; these are re-estimated using market price for columns 1A and 2A for arriving at consumption aggregates.

The results in columns (1)-(4) show sharp drop in different categories of per capita consumption expenditure. However, the drop is relatively less for households engaged in wage labor, which had lower levels of per capita consumption expenditure even prior to the pandemic.

Table 2: Change in Real Per Capita Expenditure

	$\log(\frac{C_{i,t}}{C_{i,t-1}})$					
Dependent Variables (per capita figures, in logs) →	(1) Total Consumption (market value)	(1A) Total Consumption (purchase price)	(2) 30 days Food items (market value)	(2A) 30 days Food items (purchase price)	(3) 30 days non-food items	(4) Discretionary items (365 days)
$\log(\frac{PCI_{i,t}}{PCI_{i,t-1}})$	0.09***	0.09***	0.08***	0.04***	0.08***	0.14***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Home production (cereals)	0.06*	0.05*	0.11***	0.11***	-0.03	0.00
	(0.086)	(0.098)	(0.000)	(0.000)	(0.473)	(0.977)
Household size	-0.02***	-0.02***	-0.02***	0.03***	-0.01	-0.01
	(0.002)	(0.002)	(0.000)	(0.000)	(0.102)	(0.498)
Share of dependents	-0.00	-0.01	-0.02	-0.07*	0.01	-0.04
	(0.944)	(0.905)	(0.617)	(0.055)	(0.873)	(0.696)
Primary Sources of 2019 income (Reference: Agriculture & Allied)						
Business 2	0.09**	0.09**	0.15***	0.14***	0.01	-0.01
	(0.024)	(0.023)	(0.000)	(0.000)	(0.733)	(0.913)
Wage Labor 3	0.15***	0.15***	0.21***	0.18***	0.05	0.12
	(0.000)	(0.000)	(0.000)	(0.000)	(0.275)	(0.200)
Salaried 4	0.10***	0.10***	0.14***	0.12***	-0.03	0.07
	(0.005)	(0.005)	(0.000)	(0.000)	(0.358)	(0.396)
Other income 5	0.07	0.07	0.13***	0.21***	0.03	0.06
	(0.105)	(0.111)	(0.000)	(0.000)	(0.412)	(0.516)
Income loss (Ref. category:: No loss)						
Due to Mobility loss 1	-0.10	-0.10	-0.03	-0.00	-0.10	-0.19
	(0.201)	(0.199)	(0.641)	(0.939)	(0.196)	(0.304)
Due to earnings loss 2	-0.06**	-0.06**	-0.03	-0.03	-0.05*	-0.14**
	(0.022)	(0.026)	(0.171)	(0.122)	(0.069)	(0.013)
BPL card Reference category: APL						
No card	-0.05**	-0.06**	-0.04*	0.01	-0.09***	-0.02
	(0.031)	(0.027)	(0.052)	(0.790)	(0.001)	(0.771)
BPL card	0.01	0.01	0.04	0.00	0.01	-0.10
	(0.750)	(0.792)	(0.130)	(0.913)	(0.829)	(0.154)
Highest level of education in household (Reference: up to primary (<6 years)						
Middle (6-9 years)	0.01	0.00	0.01	-0.07*	0.02	0.03
	(0.888)	(0.902)	(0.705)	(0.056)	(0.729)	(0.736)
Secondary (10-11 years)	0.06	0.06	0.04	-0.11***	0.09*	0.12
	(0.159)	(0.179)	(0.320)	(0.004)	(0.077)	(0.243)
Higher Secondary (12 – 13 years)	0.04	0.03	0.01	-0.13***	0.07	0.07
	(0.411)	(0.425)	(0.871)	(0.001)	(0.163)	(0.449)
Graduates & above (14 years & +)	0.11**	0.11**	0.07*	-0.11***	0.12**	0.16
	(0.016)	(0.018)	(0.069)	(0.008)	(0.024)	(0.123)
Caste and Religious Groups (Reference: Forward caste)						
Other Backward Communities 2	-0.02	-0.02	-0.01	-0.03	-0.02	-0.02
	(0.532)	(0.565)	(0.571)	(0.222)	(0.475)	(0.688)
Schedules Castes / Tribes 3	0.03	0.03	0.00	-0.02	0.00	0.03
	(0.388)	(0.359)	(0.869)	(0.505)	(0.947)	(0.695)
Muslim 4	-0.03	-0.02	-0.05	-0.13***	-0.07	-0.01

	(0.514)	(0.553)	(0.154)	(0.000)	(0.148)	(0.958)
Christian, Jain, Buddhist 5	-0.01	-0.00	0.07	0.11	-0.19***	-0.18
	(0.944)	(0.970)	(0.365)	(0.225)	(0.003)	(0.355)
Household Assets quintile (Ref. category: richest quintile)						
Poorest quintile 1	0.17***	0.17***	0.06	0.11***	0.17***	0.24**
	(0.001)	(0.000)	(0.116)	(0.003)	(0.001)	(0.024)
2nd quintile 2	0.11**	0.11**	0.04	0.05	0.11**	0.08
	(0.026)	(0.019)	(0.284)	(0.148)	(0.014)	(0.392)
Middle quintile 3	0.06	0.06	0.05*	0.04	0.12***	-0.02
	(0.159)	(0.129)	(0.062)	(0.143)	(0.005)	(0.845)
4th quintile 4	-0.00	0.00	0.03	0.01	0.02	-0.08
	(0.973)	(0.971)	(0.208)	(0.719)	(0.598)	(0.359)
Urban (1) vs Rural (0)	-0.01	-0.01	-0.07**	-0.05*	0.05	0.03
	(0.735)	(0.766)	(0.020)	(0.100)	(0.237)	(0.666)
State dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.18**	-0.18**	-0.10*	-0.05	-0.05	-0.40**
	(0.020)	(0.018)	(0.073)	(0.396)	(0.548)	(0.022)
Observations	4,144	4,144	4,142	4,142	4,144	4,135
R-squared	0.054	0.054	0.081	0.074	0.041	0.023

Note: Standard errors are clustered at the PSU level. Standard errors reported in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1. All consumption figures are in real terms, adjusted for 2019 prices. PCI stands for per-capita income in real terms, adjusted for 2019 prices.

Figure 3: Predicted Change in Per Capita Expenditure

Fig 3A(1): Per Capita Consumption Expenditure (Purchase price)

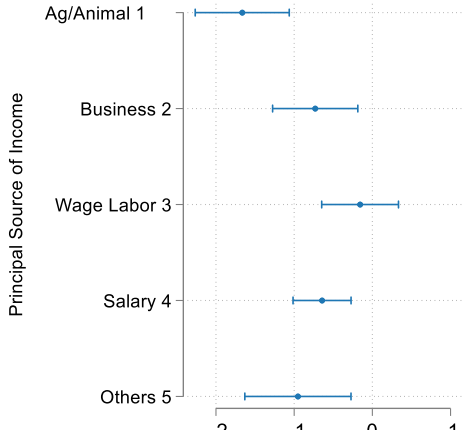


Fig 3A(2): Per Capita Consumption Expenditure (Market price)

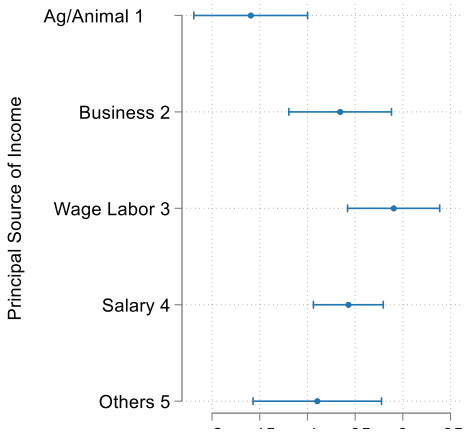


Fig 3B(1): Per Capita Food Expenditure (Purchase price)

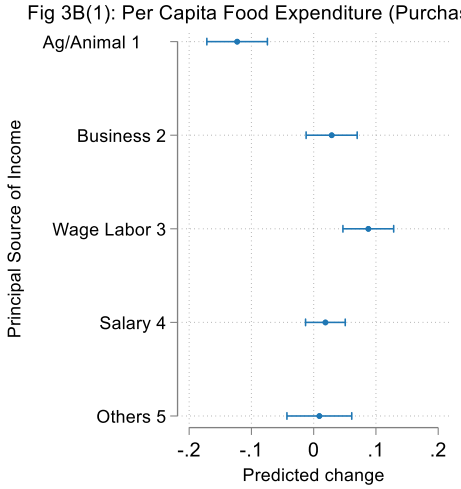
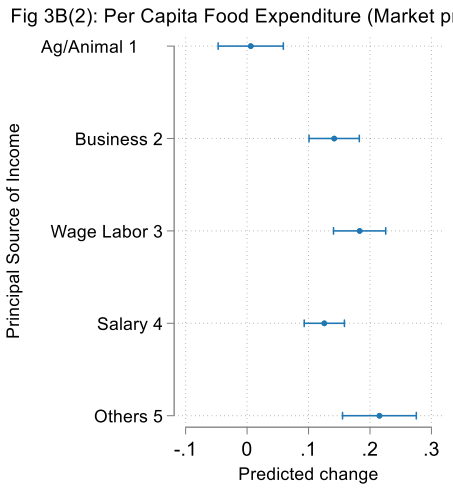
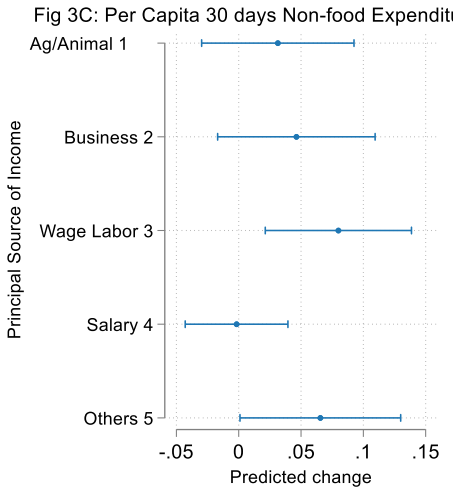
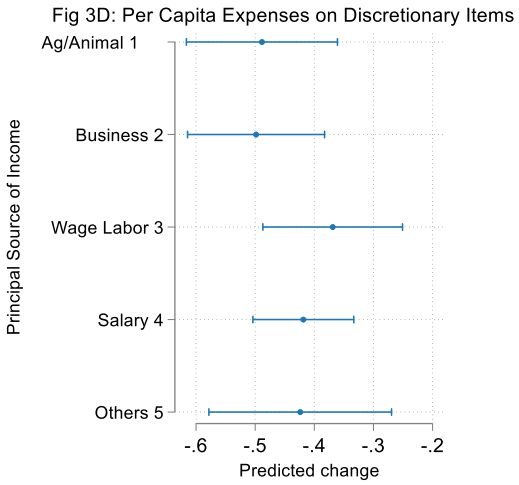


Fig 3B(2): Per Capita Food Expenditure (Market price)







Note: Estimates are based on results presented in Table 2. All figures were adjusted for 2019 prices. The standard error bars represent the 95 percent confidence intervals.

Figures 3A – 3D show change (measured in terms of log of the ratio of real per capita consumption) how the growth rate for different categories of consumption bundles varies across broad occupational groups. Average (geometric) real per capita consumption expenditure (using purchase price) decreased by approximately 6.4 percent and 7.3 percent for salaried and business households, and by 1.6 percent for daily wage labor households between 2019 and 2021. These figures stand at 5.7 and 6.6 percent respectively for business and salaried households, and by 0.9 percent for daily wage labor households, when expenditure is re-evaluated using market prices for subsidized food grains. However, in both the cases the predicted change for daily wage labor households are not statistically significant at any of the conventional levels.

Per capital real expenditure on food items (measured at market prices) increased by 14.2 percent for households with businesses, by 12.6 percent for salaried households, and by 18.3 percent for those engaged in wage labor, all statistically significant ($p<0.01$). Estimating at recorded purchase price, the coefficient estimate for the daily wage labor household increased by 8.8 percent ($p<0.01$).The estimates for salaried and business households are positive but not statistically significant. For agricultural (landed) households, per capita food expenses at

purchase price decreased by 1.2 percent ($p<0.01$) based on purchase price, while increasing by 0.6 percent ($p=0.826$) when estimated using market price.

Per capita expenditure on discretionary items decreased by 42 percent for salaried households, 48.9 percent for agricultural households, 49.9 percent for business households, and by 37 percent for daily wage labor households ($p<0.01$ for all). Non-food essential items show an increase by 8 percent over the two period for daily wage labor ($p<0.01$). The coefficients are not statistically significant for other income categories at conventional levels.

Table 2 estimates also indicate households consuming crops or animal bi-products from their own home production (agricultural or animal farm) are likely to observe an increase in the value of food consumption by 11 (see columns 2 and 2A respectively). This indicates that home production of crops and allied products is likely to enhance food security when households are afflicted by exogenous shocks to their income. Note, that consumption from home produced goods is valued at market price. Households residing in urban areas observed drop in per-capita food expenditures by 7 percent, ($p<0.01$) unlike their rural counterparts, which was relatively insulated from the adverse shock of the pandemic (see column 2). Unlike the urban sector, the rural sector was opened up earlier to prevent food shortage. When re-estimated (column 2A) using market prices, the drop is by 5 percent, but statistically significant now only at the ten percent level. The results also show that while food expenditure may have dropped, the difference in consumption based on type of ration card (APL or BPL), or absence of one, is not statistically significant (see columns 2 and 2A). This may be due to the extensive outreach of the food subsidy program extended by the government, whereby both BPL and APL households were covered by the additional subsidy program. Also, several state governments extended the outreach via food coupons for those without ration card to reduce the likelihood of excluding households facing food insecurity.

We also observe from Table 2 that loss of income, stemming from drop in earnings, had the biggest effect on discretionary purchases, followed by non-food essential item, dropping by 15 and 4 percent, respectively for those suffering from earnings loss, in comparison to those who did not suffer any losses (see columns 3 and 4). We further observe that the elasticity of

expenditure with respect to current income is less than one in all cases[5]. The elasticity is 9 percent for overall annual per capita consumption expenditure, 8 percent for food expenditure at purchase price, 4 percent for food expenditure at market price, and 8 and 14 percent, respectively, for non-food essential items and discretionary purchases. This also explains that changes in consumption expenditure is less responsive to fall in current income, and households resorted to alternate mechanisms to smooth their consumption over the two periods.

5.2 Change in quantity of food grains consumed

In contrast to the broad aggregates presented in Table 2, Table 3, presents the change in overall quantity of food grains (rice and wheat) consumed (column 1), the quantity of food grains consumed that was bought exclusively from the PDS (fair price) shops. We observe that increase in food grains subsidy from the PDS shops is likely to have boosted per capita grains consumption, particularly in terms of increased uptake from PDS shops. Column (1) signifies change in overall quantity of food grains consumed between 2021 and 2019, whether bought from the PDS shops or directly from the market. Column (2) captures quantities only bought from PDS shops at subsidized prices. For column (2), we use inverse hyperbolic sine (IHS) transformation for both the dependent variable and one of the independent variables (change in real value of food grains subsidy received between 2021 and 2019). The transformation was adopted as a significant proportion of the population did not purchase these grains from the PDS shops, as discussed in Section 5.We also run a zero-inflated Poisson regression for change in food grains consumed from the PDS shops. We use ownership of BPL food ration card as the inflation factor. Our results show that in comparison to those holding APL cards, households with BPL cards are more likely to report purchase of subsidized food grains; in contrast absence of food ration card is likely to be a hurdle in accessing the subsidy. . Both column 2 (IHS transformation) and column 3 also show that the subsidy was pro-poor, with households in lower quintiles benefitting progressively from the additional food grains subsidy.

[5] We re-estimated equation (1) for all alternate measures of consumption using quadratic specification for the ratio of per-capita income (in logarithm). The coefficient for the quadratic term is trivial and statistically insignificant, and have not been reported here. Further, the direction and the effect size of other coefficients are robust to the alternate quadratic specification.

The results indicate increases in quantity consumed from its initial level in 2019, both the overall quantity and that bought from the fair price shops under the public distribution system (PDS). While the overall quantity of food grains consumption may have dipped (see Figure 4A), also indicated from our previous discussion in Section 5 (Figures 2A and 2B), the fall was relatively less than it would have been otherwise due to the food grains subsidy extended by the government through the fair price shops - this helped sustain food consumption. Figures 4A and 4B suggest that the average (geometric) per capita food grains (market and PDS) expenditure decreased by 3.6 percent (p-value=0.087) for daily wage labor households, and by 6.5 percent for agricultural households ($p<0.01$) It dropped by 1.4 and 2.1 percent for salaried and business households respectively between 2019 and 2021, but these figures are not statistically significant. Quantity of food grains bought from the PDS shops increased by 67 percent for daily wage households, by 66 and 69.7 percent for salaried and business households, and by 62 percent for agricultural households (see Figure 4B) – these figures correspond to column (3) in Table 3, where quantity of food grains bought from PDS shop is estimated using zero-inflated Poisson regression. The increase is by 48 percent for households across income groups when we use the inverse hyperbolic sine (IHS) transformation for the dependent variable. We use inverse hyperbolic sine transformation for the explanatory variable, change in real value of food grains subsidy received between 2021 and 2019.

Table 3: Change in Per Capita Food Grains (rice & wheat) Consumption (in quantities)

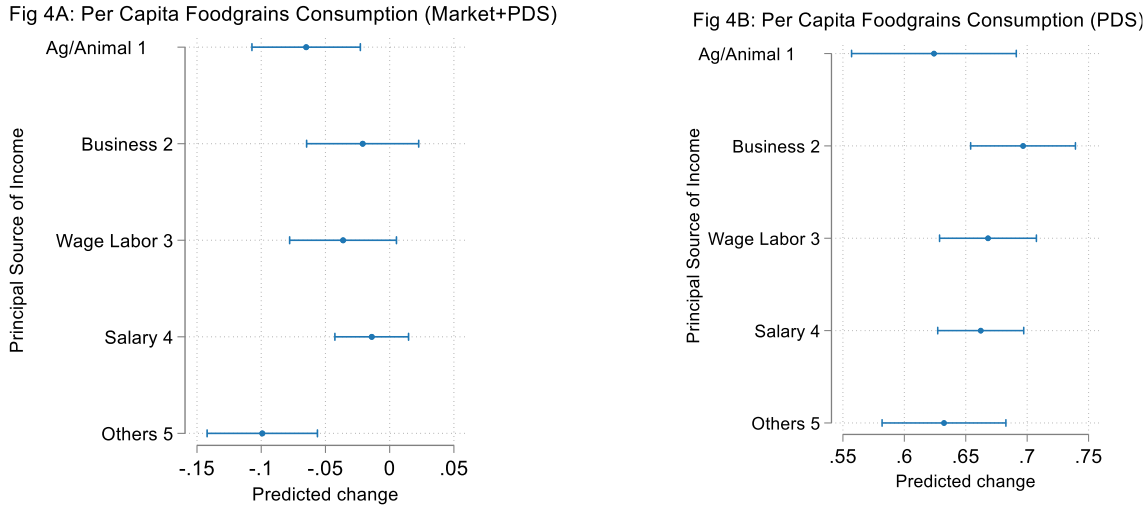
	$\log(\frac{Q_{i,t}}{Q_{i,t-1}})$		
	(1)	(2)	(3)
Dependent Variables (per capita figures, in logs) →	Food grains consumption	Food grains consumption (PDS)	Food grains consumption (PDS)
	Log transformation	IHS transformation	Zero-inflated Poisson
$Subsidy_{2021}/Subsidy_{2019}$	0.11***	0.97***	1.42***
(IHS transformation)	(0.000)	(0.000)	(0.000)
Log (PCI_{2019}/PCI_{2021})	0.01	0.00	0.03
	(0.125)	(0.651)	(0.172)
Home production (cereals)	0.04	-0.02*	-0.08*
	(0.118)	(0.059)	(0.058)
Household size	-0.01***	0.00	0.00
	(0.000)	(0.843)	(0.801)
Share of dependents	0.04	-0.02	-0.08
	(0.213)	(0.294)	(0.255)
Primary Sources of 2019 income (Ref. category: Agriculture & Allied 1)			

Business 2	0.04	0.00	0.11*
	(0.165)	(0.949)	(0.074)
Wage Labor 3	0.03	-0.00	0.07
	(0.340)	(0.964)	(0.270)
Salaried 4	0.05**	-0.00	0.06
	(0.047)	(0.732)	(0.329)
Other income 5	-0.03	-0.01	0.01
	(0.262)	(0.501)	(0.849)
Income loss			
(Ref. category:: No loss)			
Due to Mobility loss 1	-0.10**	-0.03	-0.05
	(0.039)	(0.168)	(0.720)
Due to earnings loss 2	-0.03	-0.00	0.04
	(0.100)	(0.975)	(0.258)
BPL card (reference category: APL 3)			
No card 1	0.06***	-0.04***	
	(0.007)	(0.002)	
BPL card 2	-0.03	0.01	
	(0.167)	(0.512)	
Highest level of education in household (Ref. category: up to primary (<6 years)			
Middle (6-9 years)	0.04	0.01	0.10*
	(0.163)	(0.418)	(0.083)
Secondary (10-11 years)	0.06*	0.01	0.09
	(0.079)	(0.588)	(0.136)
Higher Secondary (12 – 13 years)	0.05	-0.00	0.06
	(0.139)	(0.847)	(0.371)
Graduates & above (14 years & +)	0.07*	0.00	0.02
	(0.062)	(0.771)	(0.829)
Caste and Religious Groups			
(Ref. category: Forward caste)			
Other Backward Communities 2	-0.03	0.00	0.13**
	(0.135)	(0.885)	(0.013)
Schedules Castes / Tribes 3	-0.01	0.01	0.12**
	(0.638)	(0.277)	(0.021)
Muslim 4	-0.03	0.01	0.13*
	(0.346)	(0.597)	(0.075)
Christian, Jain, Buddhist 5	-0.02	0.00	0.22***
	(0.561)	(0.801)	(0.003)
Household Assets quintile			
(Ref. category: richest quintile)			
Poorest quintile 1	0.01	0.03***	0.56***
	(0.678)	(0.004)	(0.000)
2nd quintile 2	0.03	0.02*	0.51***
	(0.346)	(0.058)	(0.000)
Middle quintile 3	0.02	0.02***	0.47***
	(0.572)	(0.007)	(0.000)
4th quintile 4	0.02	0.02***	0.36***
	(0.437)	(0.003)	(0.002)
Urban (1) vs Rural (0)	-0.00	-0.00	0.11*
	(0.936)	(0.892)	(0.053)
State dummies	Yes	Yes	Yes
Constant	-0.15***	0.04	-2.17***
	(0.005)	(0.161)	(0.000)
Zero-Inflation factor: BPL card (reference category: APL 3)			
No card 1			21.77***
			(0.000)
BPL card 2			-17.06***

			(0.000)
Observations	4,135	4,144	4,144
R-squared	0.037	0.920	
Wald chi-squared(27)			2836.66
Prob > Chi-squared stats			0.00

Note: Standard errors are clustered at the PSU level. Standard errors reported in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1.

Figure 4: Predicted Change in Per Capita Consumption (quantity)



Note: Estimates are based on results presented in Table 3. The standard error bars represent the 95 percent confidence intervals. Figure 4B corresponds to column 3 in Table 3 (zero-inflated Poisson regression).

5.3 Other food items

In addition to consumption of cereals, which was relatively well anchored due to subsidized food grains received from fair price shops, we examine the effect of subsidy on other food items. By extending the provision of cheaper food grains (rice and wheat), the subsidy program may have also enhanced consumption of cereal complements, items that are typically consumed with food grains, such as vegetables and pulses. On the other hand, cereal substitutes, such as dairy products, fruits and nuts, and non-vegetarian items provide alternative sources of calories in a typical Indian diet and are also more expensive sources of calories compared to food grains and its complements. Table 4 provides estimates of changes in complementary and substitute food items between 2019 and 2021, along with corresponding predicted change in per capita consumption across livelihood groups in Figures 5 and 6.

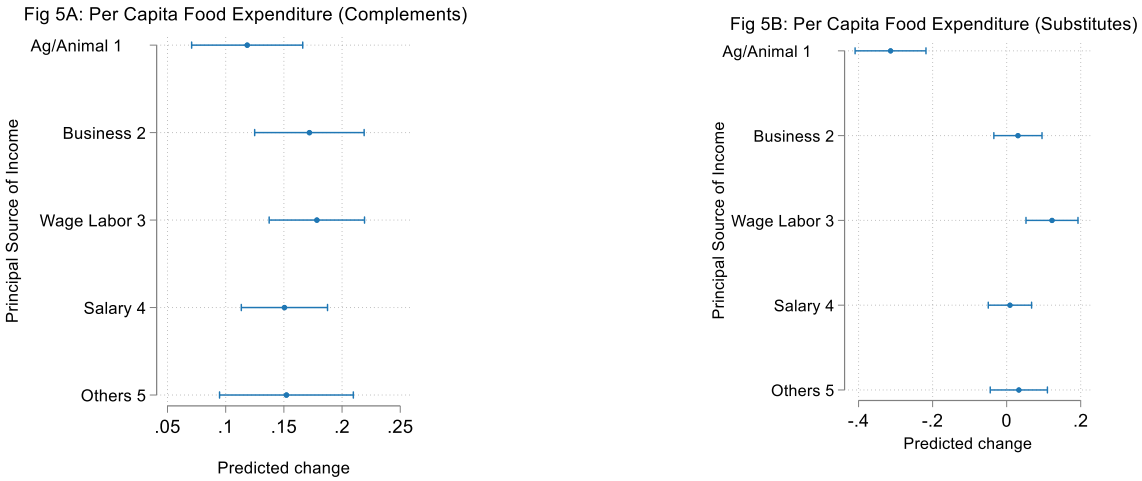
Table 4: Change in Real Per Capita Consumption of Complement and Substitute Food items

	$\log(\frac{C_{i,t}}{C_{i,t-1}})$	
Dependent Variables (per capita figures, in logs) →	(1) Consumption of complements	(2) Consumption of substitutes
Log (PCI_{2019}/PCI_{2021})	0.03***	0.13***
	(0.002)	(0.000)
$Subsidy_{2021}/Subsidy_{2019}$	0.04***	0.06*
(IHS transformation)	(0.009)	(0.056)
Home production (cereals)	0.01	0.28***
	(0.824)	(0.000)
Household size	-0.01***	-0.02**
	(0.004)	(0.011)
Share of dependents	0.02	-0.02
	(0.601)	(0.784)
Primary Sources of 2019 income (Ref. category: Agriculture & Allied)		
Business 2	0.05	0.34***
	(0.105)	(0.000)
Wage Labor 3	0.06*	0.44***
	(0.055)	(0.000)
Salaried 4	0.03	0.32***
	(0.294)	(0.000)
Other income 5	0.03	0.35***
	(0.315)	(0.000)
Income loss (Ref. category: No loss)		
Due to Mobility loss 1	0.05	-0.05
	(0.434)	(0.580)
Due to earnings loss 2	-0.02	-0.00
	(0.335)	(0.929)
BPL card: (Ref. category: APL 3)		
No card 1	-0.01	0.02
	(0.753)	(0.598)
BPL card 2	0.02	0.09*
	(0.424)	(0.051)
Highest level of education in household (Ref. category: up to primary (<6 years)		
Middle (6-9 years)	-0.01	0.01
	(0.805)	(0.849)
Secondary (10-11 years)	0.01	0.04
	(0.800)	(0.438)
Higher Secondary (12 – 13 years)	-0.01	0.06
	(0.805)	(0.299)
Graduates & above (14 years & +)	0.03	0.13**
	(0.455)	(0.044)
Caste and Religious Groups (Ref. category: Forward caste)		
Other Backward Communities 2	-0.00	-0.03
	(0.924)	(0.447)
Schedules Castes / Tribes 3	-0.03	-0.00
	(0.319)	(0.970)
Muslim 4	-0.11***	-0.02
	(0.003)	(0.707)
Christian, Jain, Buddhist 5	0.00	0.06
	(0.985)	(0.534)
Household Assets quintile		

(Ref. category: richest quintile)		
Poorest quintile 1	0.14***	-0.00
	(0.001)	(0.973)
2nd quintile 2	0.11***	0.02
	(0.005)	(0.732)
Middle quintile 3	0.11***	0.03
	(0.002)	(0.571)
4th quintile 4	0.07**	0.03
	(0.037)	(0.436)
Urban (1) vs Rural (0)	-0.13***	-0.11**
	(0.000)	(0.037)
State dummies	Yes	Yes
Constant	0.08	-0.44***
	(0.203)	(0.000)
Observations	4,137	4,113
R-squared	0.064	0.079

Note: Standard errors are clustered at the PSU level. Standard errors reported in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1.

Figure 5: Predicted Change in Per Capita Consumption of Compliments and Substitutes



Note: Estimates are based on results presented in Table 4. All figures were adjusted for 2019 prices. The standard error bars represent the 95 percent confidence intervals.

The results from Table 4 (column (1)) along with Figures 5A show that per capita consumption of complementary food items increased for all income groups, but the increased was highest amongst those reporting daily wage labor and household business (17.8 and 17.2 percent increase respectively, p<0.01). This was followed by salaried households (15 percent increase, p<0.01) and agricultural households (11.8 percent increase, p<0.01).

The results also show (Table 4, column (2) and Figure 5B) that per capita consumption of substitute goods increased by 12.2 percent (p<0.05) for daily wage labor households, while

decreasing for agricultural households by 31percent ($p<0.01$). The estimates are not statistically significant for other income groups. Interestingly, per capita consumption of both food groups fell for urban households. Interestingly, results from Table 4 also show that Increase in food grains subsidy received is positively associated with increase in consumption of cereal complements ($p<0.01$). The estimate is significant only at the ten percent level for cereal substitutes. Note that these figures reflect change from prior levels for the respective category. Interestingly, consumption from home produced cereals is associated with an increase in consumption of substitutes by 28 percent.

6 Concluding remarks

As the Indian economy trudged along through the multitude of lockdown and unlocking phases in the midst of Covid-19 infections, the livelihood shock was felt across a wide spectrum of households. Our data further show that on average per-capita consumption dropped considerably, barring food consumption, indicating that households were able to smooth food consumption better in response to the livelihood shock perpetuated by the pandemic, primarily backed by food grains subsidy. This is particularly evident particularly amongst poorer households, where we observe increase in food consumption in terms of both cereals (rice and wheat) and other food items that are both consumed along with such starchy cereals (such as vegetables, pulses, oil, etc.) along with substitute items such as diary and fruits – this could have been the result of freed up cash that households would otherwise spend on consumption of coarse cereals. Our results show that the decline in per-capita consumption expenditure was mainly driven by reduction in expenditure on discretionary purchases, such as large household items, rather than on food and fuel. While the results presented in this paper do not show prevalence of wide-spread starvation, it needs to be noted that the Delhi NCR is a privileged region, and its results are selective.

Our data also show that nearly 59.8 percent of households in the existing sample received food support from government welfare programs in the form of additional food grains during the pandemic, but some of the most vulnerable were left out. For instance, nearly 25.9 and 32.7 percent of the households in the poorest and the second poorest assets deciles had no access to the extra food support program, and may have suffered from food insecurity at some point during the pandemic, calling for better targeting of food subsidy.

We also observe that the subsidies remained largely pro-poor, with the total value of monthly per capita subsidies for BPL families substantially higher, and benefitted those most affected by the pandemic. Using 2021 data, we further observe that nearly 79.1 percent of households that drew their income from daily wage labor received PDS subsidies, while 56.3 percent of those with micro and small businesses did so. What caused the 20.9% of daily wage households and 43.7 percent of those with small businesses to be excluded from the food subsidy program? This could have stemmed from a variety of issues – from non-availability of ration, if members suffered from health issues during the pandemic, or if mobility restrictions prevented them from travelling to PDS shops, or if migrant households did not have valid ration cards. The latter reinforces the case for one nation one ration card (ONORC) scheme, allowing for portability of ration cards across states under the National Food Security Act (NFSA), in order to aid ease of access to food subsidy and achieve food security, a core pillar of Sustainable Development Goal-2.

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