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

Pallavi Choudhuri, Sonalde Desai, and Santanu Pramanik

December 2022

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 indicate that households were able to smooth their food consumption expenditure, particularly for starchy cereals such as rice and wheat, along with cereal complements, such as vegetables, pulses, and other items that are consumed 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 BPL (below poverty line) households labouronce 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

---

Pallavi Choudhuri: National Council of Applied Economic Research (NCAER), New Delhi, India
Sonalde Desai: University of Maryland, Department of Sociology, Maryland, USA & NCAER, India
Santanu Pramanik: NCAER, India
Corresponding author: Pallavi Choudhuri, pchoudhuri@ncaer.org

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), labour 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) 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 covariate 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 hypothesize:

a. The food subsidy program extended by the government is likely to allow households to smooth their food consumption
b. The additional subsidized food grains will increase the consumption of cereal complements, which are typically consumed along with starchy coarse grains / cereals such as rice and wheat in Indian households.

- While consumption of cereal substitutes are likely to increase during usual times when households have more cash in hand, during crisis period, as households maximize their welfare subject to their budget constraint, consumption of cereal complements are more likely to rise.

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 6 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

We examine which households were more affected than others by the Covid-19 crisis, and their coping mechanisms. More specifically, our paper looks at whether the food subsidy program extended by the government through the PDS network offered a formal insurance mechanism to smooth consumption, and who were better able to do so.

3.1 Consumption items:

We use two alternate measures of per capital annual household consumption expenditure, driven by alternate measures of food expenditure. Within consumption expenditure, we separately examine changes in food expenditure, non-food expenditure, and expenditure on discretionary items. Next we explain the two alternate measures of food expenditure:

1) In the first scenario, we use prices at which the consumers purchased the respective food items from the fair price PDS shops. This includes heavily subsidized prices of food grains (rice and wheat).
2) In the second scenario, we re-estimate the value of subsidized food grains by using the prevailing market prices of the food grains, – households were asked how much they would have had to pay per unit if they had to buy the subsidized food grain from the market instead. This second method allows us to compute the value of the subsidy that the household availed each month for their food grains consumption. The subsidy value can be calculated as the difference between the market price recorded by the household and the price at which households actually bought the subsidized food grain from the PDS shop.

The consumption expenditure module was designed with a mixed recall period. The total household consumption expenditure is constructed from a set of 33 categories that comprise commonly used items – these are restricted to a 30 day recall period, 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.

3.2 Alternate measures:

We examine changes in consumption expenditure over the following categories: (i) total annual per capita expenditure (at purchase price), (ii) total annual per capita expenditure (re-estimated at market price), (iii) food expenditure (at purchase price), (iv) food expenditure (re-estimated 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.

Using data from 2019 and 2021, we estimate the following equation measuring the effect of change in log income on the change in log consumption:

$$\log(C_{i,t}) = \beta_0 + \beta_1 \log(Y_{i,t}) + \beta_2 X_{it} + v_i + s_t + \varepsilon_{it} \quad -(1)$$

where $C_{i,t}$ captures the per capita annual consumption in household *i* during period t; $Y_{i,t}$ denotes the per capita current income of household *i* during period t; v_i are household fixed effects; s_t represents time dummies; β_0, β_1, β_2, are parameters to be estimated; ε_{it} is the idiosyncratic error term. Standard errors are clustered at the PSU level. 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). β_1 provides an estimate an estimate of the elasticity of consumption with respect to income. X_{it} represents a range of time-varying covariates at the household level that can affect household economic status (a) household size, (b) the amount of food grains subsidy received by the household. (c) whether the household consumed food from own production - this comprises of production in agricultural farm or animal farm; : (d) year interacted with 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-labour income; (c) year interacted with whether

the household holds below poverty line (BPL[2]) identification card, 3 categories: (i) yes, (ii) no, APL (above poverty line), and (iii) no card – don't have / applied but not received. We do not include the main effects for categories (d) and (e).

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. 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 4,138 households, we observe drop in real per-capita total consumption expenditure by approximately 4 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 0.8 percent. Expenditure on food items at purchase prices[3], adjusted by CPI, increased marginally by 1.3 percent) backed by PDS subsidies extended by the government. Real food expenses, recalculated using market prices, increased by around 1.96 percent annually. Food and non-food items were both captured with a 30 day recall period. We also observe that per capita income in real terms dropped at an annual rate of approximately 14 percent, indicating that households may have been engaged in consumption smoothing between the two periods.

[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.

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

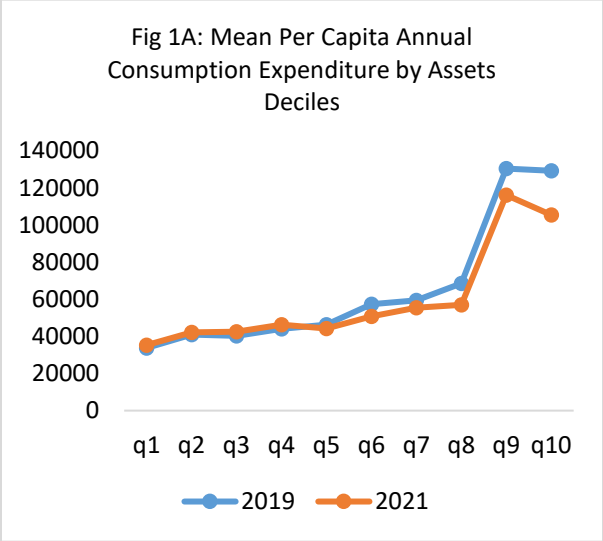
Table 1: Average Real Per-Capita Consumption Expenditure in 2019 and 2021 (in INR)

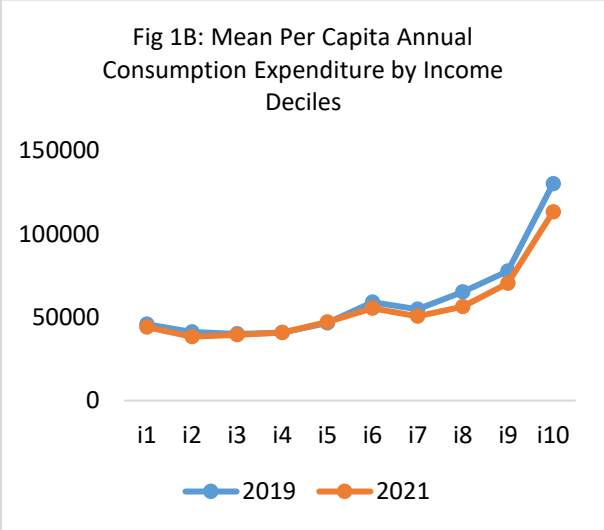
	2019	2021	2019	2021
	Purchase price		Market price	
Per capita annual consumption expenditure	56,777	52,479	57,187	53,342
	(73,110)	(70,342)	(72,166)	(70,236)
Per capita food expenditure (annualized)	19,330	19,836	19,931	20,688
(frequently purchased, 30 day recall)	(10,061)	(13,100)	(9,984)	(13,049)
Per capita non-food expenditure (annualized)	15,793	15,542	-	-
(frequently purchased, 30 day recall)	(18,914)	(13,200)		
Per capita expenditure on discretionary items	19,982	15,523	-	-
(infrequently purchased, 365 day recall)	(56,487)	(59,526)		
Total Matched Sample	4,138			

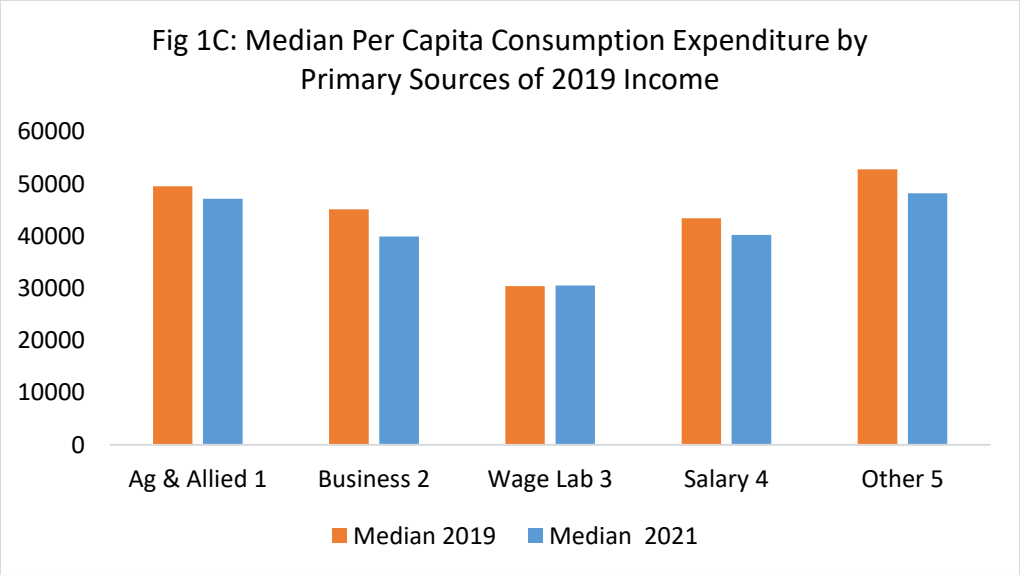
Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey (February 2019 – June 2019) and endline survey (August 2021 – Sept 2021).
Note: Figures in parentheses reflect standard deviation. All 2021 figures have been adjusted for 2019 prices, using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

Figure 1A and 1B plots consumption expenditure for the median household ranked by household assets deciles and income deciles. Irrespective of whether we use current income deciles or assets deciles, Figure 1A and 1B shows that the mean per capita annual consumption expenditure 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 1C that the drop in per-capita annual consumption expenditure is considerably higher for those reporting salaried and business income, along with non-labour income (other sources). The drop in per-capita consumption expenditure of households reporting daily wage labourer 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.

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







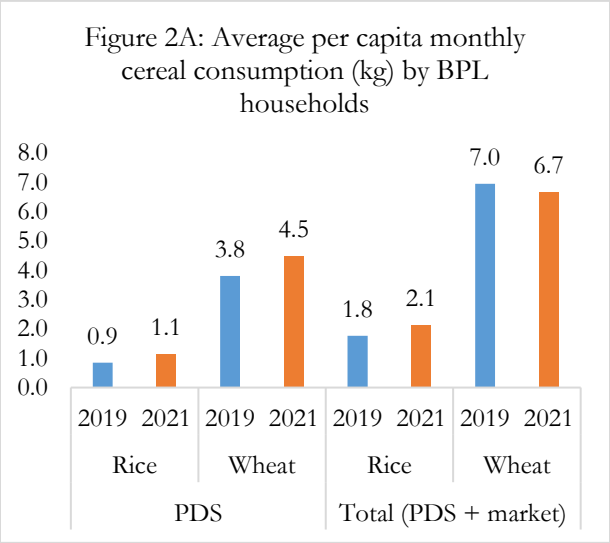
Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey and endline survey.
Note: All 2021 figures have been adjusted for 2019 prices, using monthly consumer price index, by state and sector (urban vs rural). q1-q10 represent the assets deciles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

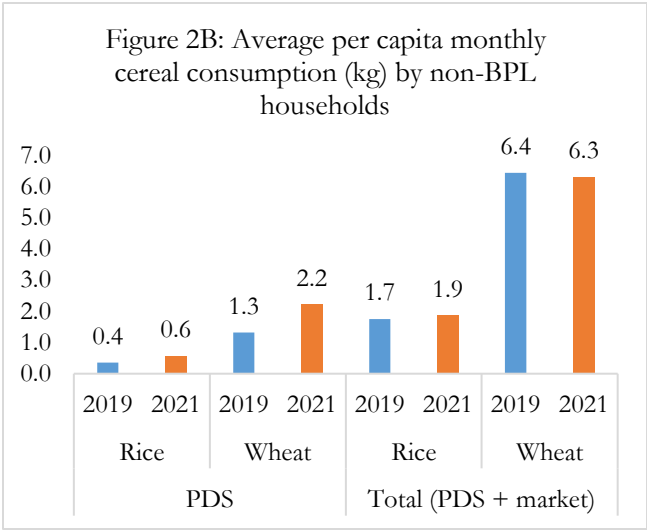
4.3 Food subsidy

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 labour.

Figures 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 6.5 kg per person in the pre-pandemic period (2019) to 1.92 kg and 6.34 kg per person, respectively, in 2021[4].

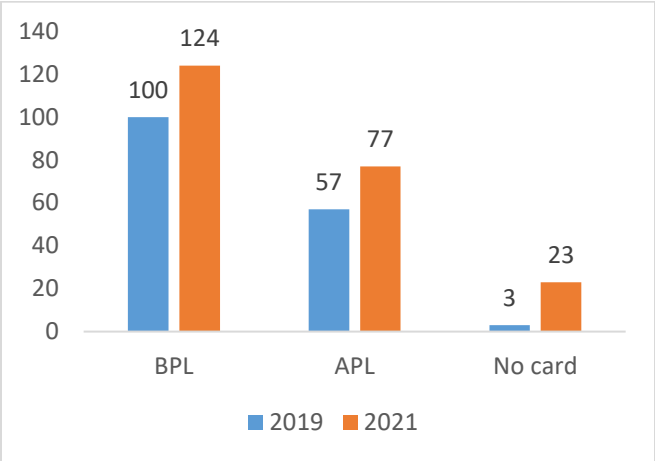
During usual times, richer households tend to buy higher quality grains from the market, but this changed during the large-scale covariate shock perpetuated by the pandemic. As the government extended food grains subsidy regardless of BPL status, both BPL and non-BPL households increasingly shifted to 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 0.8 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).

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 holders as of 2021, indicating how those above the poverty line also benefitted from the food

[4] These figures reflect weighted estimates.

subsidies program. Overall 71 percent of the sample held food ration cards (BPL and APL (above poverty line) cards) as of 2019.

Figure 2C: Average montly value of per capita subsidy of food frains (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).
Note: Estimates are adjusted for 2019 prices to reflect real values. All figures are weighted estimates. The median household with no food ration card did not receive any subsidy.

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. The average monthly per capita food subsidy received by households with no food ration card increased in 2021, but this was substantially lower than BPL or APL households. Also, important to note that very few with no ration card received any subsidy; the per capita food subsidy for the median household with no ration card is zero.

Using 2021 data from the DMAS, we observe that nearly 76.6 percent of households that drew their income from daily wage labour 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 between 2019 and 2021. For columns (1) and (2), food grains obtained from fair price (PDS) shops at subsidized prices have been recalculated at prevailing market prices (as recorded by the households) – this allowed us to calculate the value of food subsidy received across rounds. . Note that the recorded purchase price is relevant only 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. Columns (1) and (1A) signify the broad aggregate per capita consumption expenditure, while columns (2) – (4) show the sub-aggregates

Table 2: Change in Real Per Capita Expenditure (in log) between 2019 and 2021

VARIABLES	Per capita consumption (purchase price) (1)	Per capita consumption (market price) (1A)	Per capita food expenses (purchase price) (2)	Per capita food expenses (Market price) (2A)	Non-food expenses (30 days) (3)	Discretionary expenses (365 days) (4)
Per capita income (in log)	0.09***	0.08***	0.07***	0.07***	0.08***	0.14***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of household members	-0.08***	-0.08***	-0.07***	-0.07***	-0.08***	-0.03**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.032)
Home production (0/1)	0.04*	0.04*	0.09***	0.08***	-0.02	0.02
	(0.061)	(0.093)	(0.000)	(0.000)	(0.414)	(0.694)
Cereal subsidy (IHS transformation)	-0.01**	-0.00	-0.01***	0.00	0.00	-0.02**
	(0.023)	(0.467)	(0.002)	(0.306)	(0.771)	(0.044)
Year (0/1)	-0.08***	-0.08**	-0.01	-0.00	0.08**	-0.41***
	(0.007)	(0.010)	(0.583)	(0.841)	(0.014)	(0.000)
Primary Source of income *Reference:* Ag/Animal*year						
Business*year	0.00	0.00	-0.02	-0.02	-0.03	-0.01
	(0.986)	(0.919)	(0.412)	(0.559)	(0.514)	(0.938)
Wage Labour*year	0.00	0.00	-0.00	-0.00	-0.01	-0.02
	(0.985)	(0.963)	(0.957)	(0.993)	(0.847)	(0.754)
Salaried*year	-0.01	-0.01	-0.00	-0.00	-0.03	0.01
	(0.725)	(0.774)	(0.854)	(0.982)	(0.326)	(0.837)
Other income*year	0.06*	0.06	0.04	0.03	0.03	0.09
	(0.098)	(0.108)	(0.199)	(0.195)	(0.399)	(0.299)
Ration Card: (*Reference*: APL*year)						
No card*year	-0.05**	-0.06**	-0.04**	-0.05***	-0.11***	-0.02
	(0.039)	(0.022)	(0.028)	(0.007)	(0.000)	(0.751)
BPL*year	0.03	0.03	0.05*	0.04*	-0.00	-0.06
	(0.324)	(0.323)	(0.055)	(0.066)	(0.875)	(0.362)
Constant	10.26***	10.28***	9.44***	9.47***	9.00***	7.87***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.077	0.075	0.093	0.094	0.054	0.096
Number of households	4,275	4,275	4,275	4,275	4,275	4,275

Note: Standard errors are clustered at the PSU level. P-values 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.

Table 2 estimates indicate per capita consumption expenditure dropped by 8 percent between 2019 and 2021 (columns 1A and 1B). This is primarily driven by discretionary items expenditure, which dropped by 33.6 percent (column 4). While, per capita food expenditure did not change between the two time period, expenditure on frequently purchased essential items increased by 8 percent. We further observe that the elasticity of expenditure with respect to current income is less than one in all cases. The elasticity is 8 percent for overall annual per capita consumption expenditure (re-estimated at market price)[5], 7 percent for food expenditure, 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.

Households consuming crops or animal bi-products from their own home production (agricultural or animal farm) observed an increase in the value of food consumption by 9 to 8 percentage points (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.

Table 2A: Predicted change in per capita expenditure by type of ration card

Variables	Per capita consumption (purchase price) (1)	Per capita consumption (market price) (1A)	Per capita food expenses (purchase price) (2)	Per capita food expenses (market price) (2A)	Non-food expenses (30 days) (5)	Discretionary expenses (365 days) (6)
No card	-0.13***	-0.13***	-0.06***	-0.06***	-0.04	-0.42***
	(0.000)	(0.000)	(0.006)	(0.007)	(0.145)	(0.000)
BPL	-0.05*	-0.05*	0.03	0.04*	0.06**	-0.46***
	(0.061)	(0.082)	(0.128)	(0.056)	(0.034)	(0.000)
APL	-0.08***	-0.07***	-0.01	-0.00	0.07***	-0.40***
	(0.000)	(0.000)	(0.374)	(0.847)	(0.000)	(0.000)
	8,272	8,272	8,272	8,272	8,272	8,272

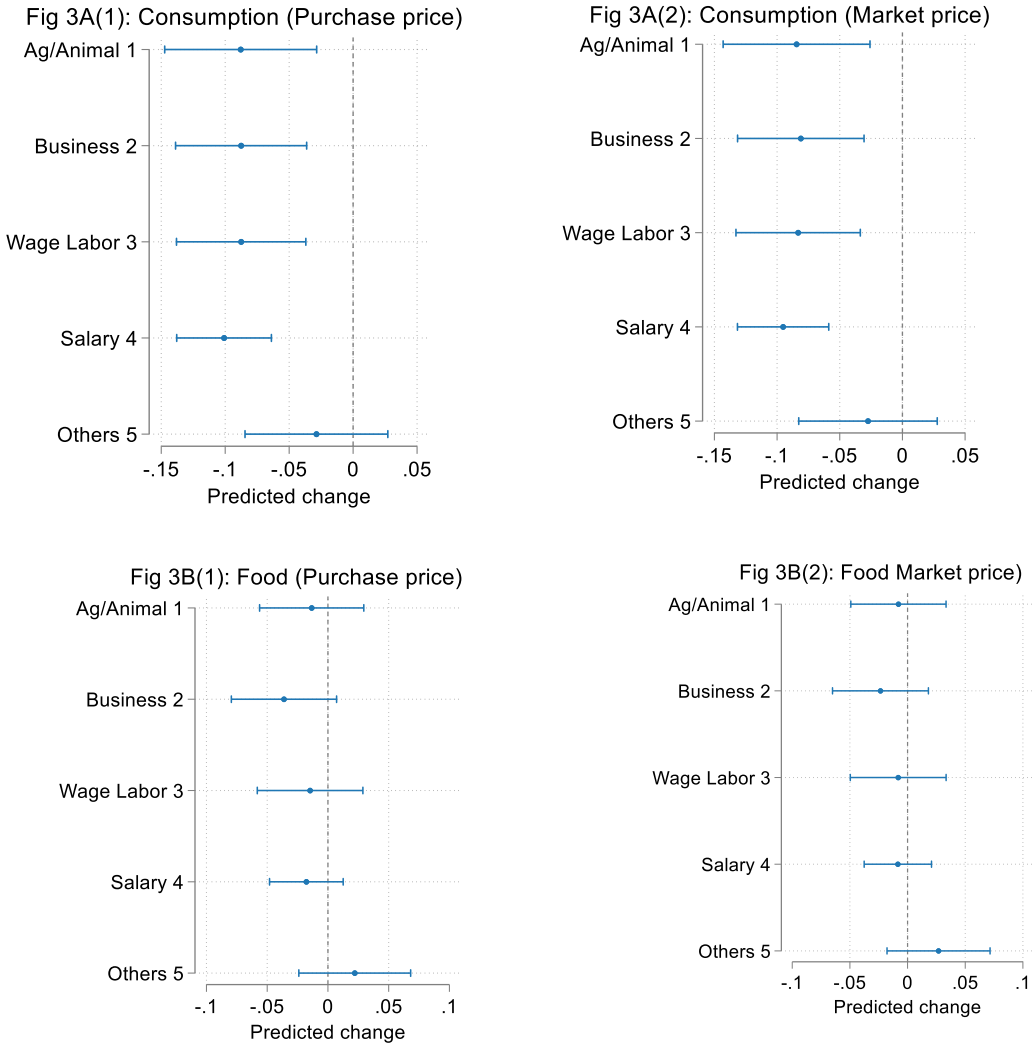
Note: Predicted change reflect marginal effects based on estimates provided in Table 2. Note: P-values are reported in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1.

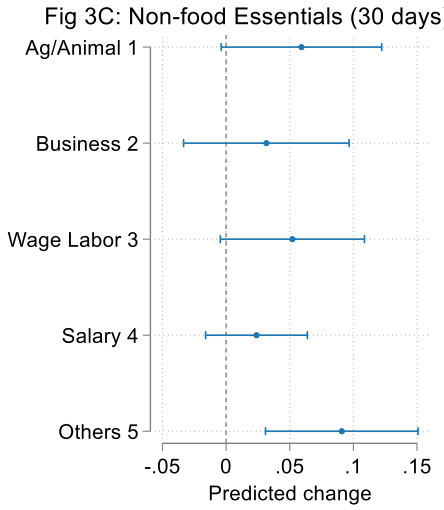
Following the lockdown announcement in March 2020, the central government had announced five kg additional food grains to be distributed through PDS shops under Pradhan Mantri Garib

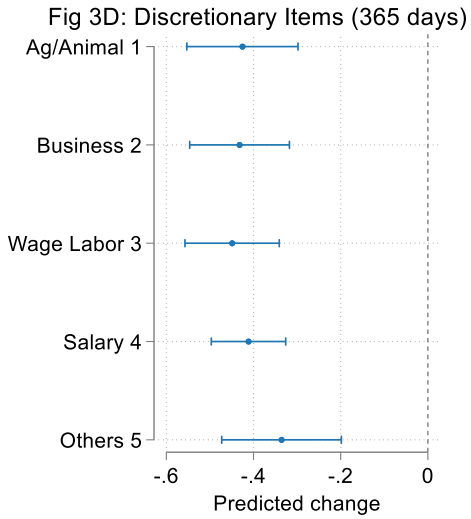
[5] This refers to re-estimating subsidized food grains from PDS shops at prevailing market prices.

Kalyan Anna Yojana (PMGKAY) for the next three months to allay fears of food insecurity; this was further extended well into 2021. While this provided easy access to food grains for those with a ration card, some households were left behind. Per capita food expenditure dropped by 6 for those with no ration card. Interestingly, when pre-capita expenditure is re-estimated using market price, expenditure on food increased for those with BPL card by 4 percent (p=0.056). This indicates that access to subsidized food grains from the PDS shop was an important coping mechanism for BPL families, while those without any card were worse-off than before. The drop in discretionary expenses are large across all groups, although we observe an increase in expenditure for essential items for BPL and APL card holders. Additionally, predicted changes in overall per-capita expenditure between 2019 and 2021, show that , while per capita annual consumption expenditure dropped for all households, the effect is highest for those without ration card, (drop by 13 percent, p<0.01).

Figure 3: Predicted change in real per capita expenditure







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.

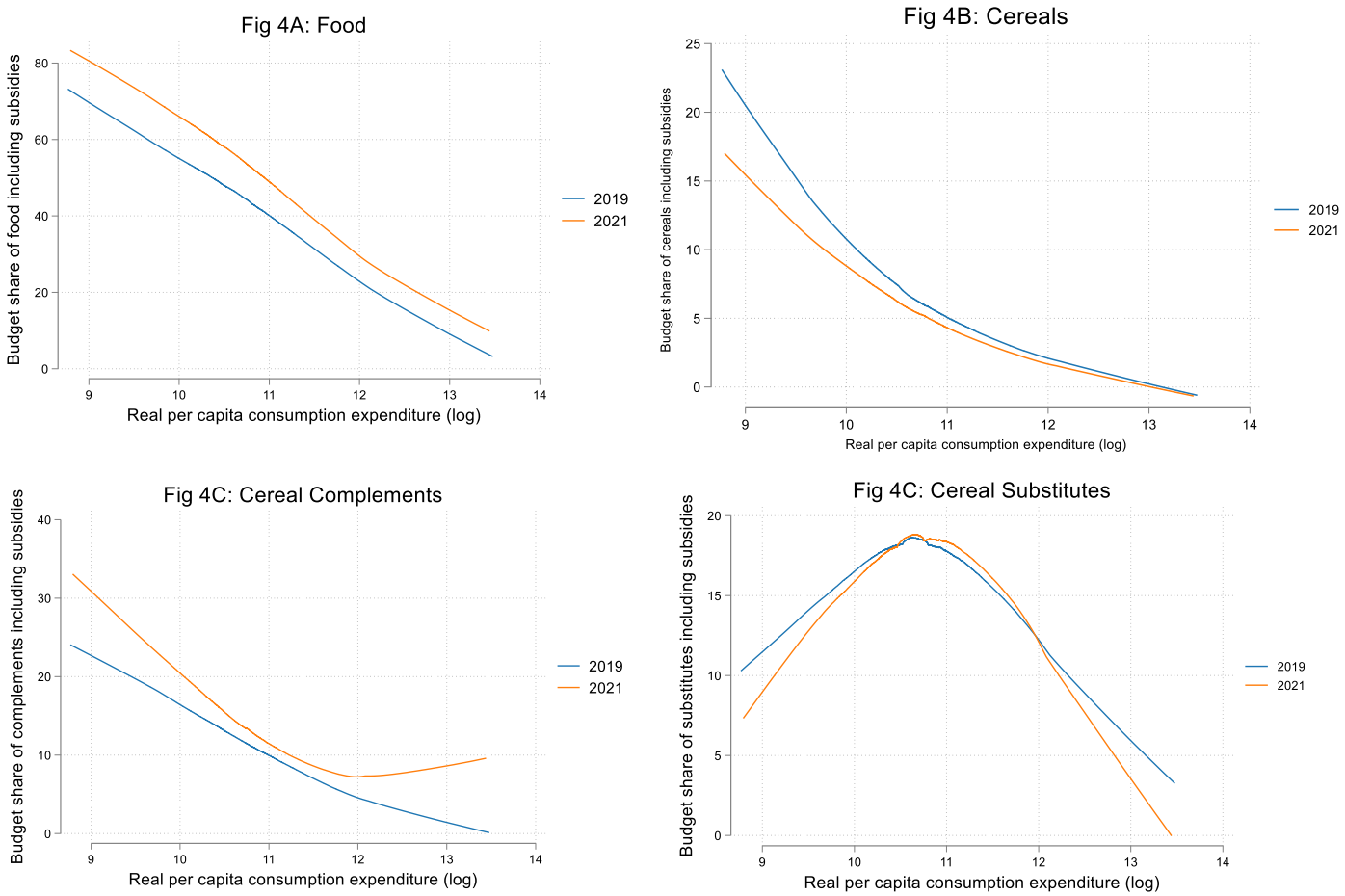
Studies have shown that those working in the informal sector were most affected by the pandemic, especially during the initial lockdown period in 2020. Choudhuri, Pramanik et al. (2022) found that nearly 71% of casual wage workers, 69% of self-employed and 71% of businesses suffered from severe income shock in the Delhi National Capital Region, with higher severity of livelihood shock amongst urban casual wage workers. How well did these occupational groups cope an year into the pandemic? Using estimates based on Table 2, Figures 3A – 3D show change in real per capita expenditure) across broad occupational groups. Real per capita consumption expenditure (using purchase price) decreased by approximately 9 percent for business, agricultural, and daily wage labour households, and by 10 percent for salaried households between 2019 and 2021 (p<.001). Re-estimating using market prices, these estimates show a drop by 8 percent, except for salaried households, which still show a drop by 10 percent. Expenditure on essential items went up by 9 percent (p<0.01), 6 percent (p=0.066), and 5 percent (p=0.07) for households with non-labour income, agricultural income, and wage labour, respectively. Expenditure on discretionary items dropped the highest for wage labour households (36 percent)[6], followed by business (35 percent), agriculture (34.6 percent), salaried (33.6 percent), and non-labour income (28.5 percent). However, the change in per capita food expenditure is not statistically significant for any income categories, indicating that overall households across the board were able to smooth their food consumption.

6

5.2 Change in the composition of food bundle

The consumption bundle changed substantially between 2019 and 2021. Figure 4, which plots the Engel curve for all households using locally weighted regression of budget share on log of real per capita expenditure, shows shift in the Engel curve in 2021. As current income can be subject to extreme volatility, especially in the event of a covariate shock, we use per capita consumption expenditure, measured in real terms, which can be treated as a proxy for permanent income.

Figure 4: Budget share of per capita expenditure in real terms (2019 vs 2021)



Source: Authors' computation based on matched panel data from Delhi Metropolitan Area Study (DMAS) baseline survey and endline survey.
Note: Engel curves are estimated using locally weighted regression of non-zero budget share of respective commodity on ln(per capita real consumption expenditure). All 2021 figures have been adjusted for 2019 prices, using monthly consumer price index, by state and sector (urban vs rural). .

Figures 4A-4D shows higher share of food staples for each level of total per capita consumption expenditure in real terms. This closely follows Engel's law, which predicts that a fall in income translates to an increase in the share of necessities, such as food. The share of cereals fell,

particularly for households with lower levels of per capita real consumption expenditure. Also notice, non-linear shape of the Engel curves for cereal complements and cereal substitutes. This implies that the Working-Lesser specification depicting linear relationship between budget share and log spending may not hold, and quadratic terms are needed. This has also been shown in past studies, that while food Engel curve may be close to being linear in log of income, this may not hold for all commodities (Banks, Blundell et al. 1997).

In our case though, we observe these non-linearities emerge within food groups. While the Engel curve for share of cereal complements appear linear and downward sloping prior to the pandemic, we observe non-linear curve in 2021 – while budget share of cereal complements increase for each levels of per capita real consumption expenditure, the increase is higher at higher levels of expenditure. For cereal substitutes, however, the Engel curve indicates that such food groups can be viewed as normal good for low levels of income, while necessities for higher levels of income. Interestingly, we observe in 2021, the Engel curve shifting downwards at low and very high levels of per capita real expenditure. To examine how the budget share of these food groups evolved across different socio-economic characteristics of households, we estimate two alternate equations - we estimate equation (2A) for overall budget share of food items and budget share of cereals, and (2B) for share of cereal complements and cereal substitutes.

$$w_{it} = \partial_0 + \partial_1 X_{it} + \partial_2 \log\left(PCC_{i,t}\right) + v_i + s_t + \varepsilon_{it} \quad -(2A)$$

$$w_{it} = \partial_0 + \partial_1 X_{it} + \partial_2 \log\left(PCC_{i,t}\right) + \partial_3 \left[\log\left(PCC_{i,t}\right)\right]^2 + v_i + s_t + \varepsilon_{it} \quad -(2B)$$

where, w_{it} represents budget share of respective commodity group for household *i* during period t, $PCC_{i,t}$represents real per capita consumption expenditure, X_{it} is a vector of household correlates that were used also for estimating equation (1), such as number of household members, home production of crops, amount of per-capita food subsidy received, occupational categories, and presence of food ration card. ∂_0, ∂_1, ∂_2 are parameters to be estimated. v_i are household fixed effects; s_t represents time dummies.

A concern with using per capita expenditure as a proxy for permanent income in equations 2A and 2B is that per capita total consumption expenditure may be endogenous with the budget share of particular items as these can be jointly determined by households. To correct for this endogeneity, following Khamis, Prakash et al. (2012) we use log of per capita current income, measured in real terms, as an instrument for per capita real consumption expenditure for

equation 2A. For equation 2B, where we use quadratic term for log of per capita expenditure, we instrument both the terms with log of per capita current income and its square.

Table 3: Change in Budget Share between 2019 and 2021

VARIABLES	Food (1)	Cereals /Grains (2)	Complements (3)	Substitutes (4)
Per capita consumption (in log)	-9.48***	-5.08***	-143.58***	219.29***
	(0.008)	(0.000)	(0.004)	(0.005)
Per capita consumption (in log, square)			6.23***	-9.78***
			(0.007)	(0.005)
Number of household members	-0.77**	-0.28***	-0.71***	0.47*
	(0.030)	(0.000)	(0.000)	(0.078)
Home production	2.96***	0.08	-0.01	2.30***
	(0.000)	(0.536)	(0.973)	(0.000)
Cereal subsidy (in IHS)	0.42***	0.09***	0.21***	0.05
	(0.000)	(0.000)	(0.000)	(0.545)
Primary Source of income *Reference:* Ag/Animal*year				
Business*year	-0.99	0.64***	-0.70	-0.05
	(0.311)	(0.002)	(0.189)	(0.960)
Wage Labour*year	0.65	0.03	-0.22	0.51
	(0.475)	(0.868)	(0.634)	(0.561)
Salaried*year	-0.32	0.69***	-0.86**	0.84
	(0.723)	(0.000)	(0.028)	(0.308)
Other income*year	-0.81	0.47**	0.04	-0.29
	(0.428)	(0.020)	(0.925)	(0.735)
Ration Card: (*Reference*: APL*year)				
No card*year	-1.00	0.11	-0.69*	0.14
	(0.141)	(0.428)	(0.054)	(0.787)
BPL*year	2.27***	-0.36**	0.74*	0.51
	(0.004)	(0.028)	(0.069)	(0.421)
Year (0/1)	8.85***	-1.61***	2.54***	-0.52
	(0.000)	(0.000)	(0.000)	(0.525)
Constant	148.05***	62.31***	835.41***	-1,208.91***
	(0.000)	(0.000)	(0.002)	(0.004)
Wald chi2(*X*)	1162.13	278.18	379.29	63.26
Observations	8,272	8,272	8,272	8,272
Number of sampleid	4,138	4,138	4,138	4,138

Note: Standard errors are clustered at the PSU level. P-values reported in parentheses. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1. All consumption and income figures are in real terms, adjusted for 2019 prices. Log of per capita consumption and its square is instrumented by log of per capita income and its square.

Table 3A: Predicted change in budget share by type of ration card

VARIABLES	Food expenses (1)	Cereals (2)	Complements (3)	Substitutes (4)
No card	7.63***	-1.11***	1.42***	-0.05
	(0.000)	(0.000)	(0.000)	(0.934)
BPL	10.90***	-1.59***	2.86***	0.32
	(0.000)	(0.000)	(0.000)	(0.616)
APL	8.62***	-1.23***	2.11***	-0.19
	(0.000)	(0.000)	(0.000)	(0.660)
Observations	8,276	8,276	8,276	8,276

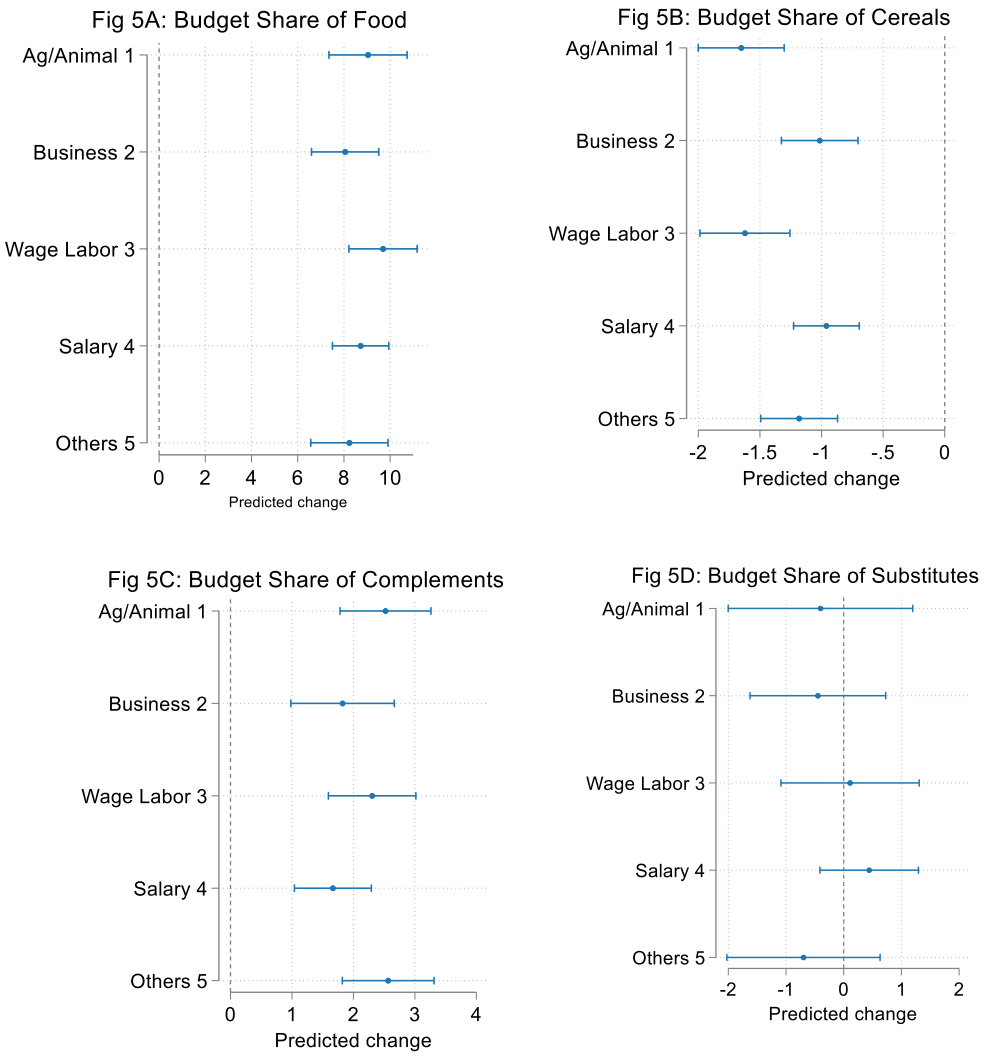
Note: Predicted change reflect marginal effects based on estimates provided in Table 3. P-values reported in parentheses s. Significance level: ***p < 0.01, **p < 0.05, *p < 0.1.

The Estimates presented in Table 3 show that the share of per capita expenses on food staples in total per capita consumption bundle went up by 8.85 percentage points between the two time periods if we include the market value of food subsidy. This goes up by 6.8 percentage points instead (not shown in table) if we include purchase price instead. The reallocation of household budget towards food stapes follows Engel's theory, which predicts that a fall in income translates to an increase in the share of necessities, such as food, as households tend to forego expenditure on discretionary items. While reallocation of expenses toward food expenses is expected in the event of such a large covariate shock, our analysis, further shows how the subsidy extended by the government further insured households in smoothing their food consumption between the two periods. This is reinforced by the coefficient estimates of per capita food subsidy received - the results also show that a one percent increase in food subsidy increases the budget share of food by 0.42 percentage points. This is primarily driven by increases in the budget share of cereals/coarse food grains and cereal complements, which goes up by 0.09 and 0.21 percentage points respectively. The coefficient estimate for home production of crops also indicate that this positively affects the budget share of estimated food consumption, potentially insulating households from external shocks. Interestingly, home production of crops is also positively associated with increase in the budget share of substitutes.

Overall, the share of food staples increased by 11 percentage points for BPL card holders, by 8.6 percentage points for APL card holders, and by 7.6 percentage points for those without any card. The budget share of cereals fell by 1.6 percentage points for BPL card holders, with a corresponding increase in 2.86 percentage points increase in the budget share of cereal complements. Access to additional provision of heavily subsidized coarse cereals, such as food grains, helped BPL households in increasing the expenditure on cereal complements, with the extra cash in hand that they would have otherwise spent on food grains. The share of cereal complements went up by 2 percentage points for APL card holders and by 1.4 percentage points for those without a card. The predicted change in the budget share of substitutes is positive for BPL households and negative for APL households and those with no ration cards, although none of these effects are statistically significant at conventional levels. During usual times, households with extra cash in hand may spend more cereal substitutes, but, during crisis period, when the welfare gains is through additional subsidy in kind in the form of coarse cereals, this is likely to be

associated with increases in cereal complements, as households attempt to maximize utility subject to their budget constraint.

Figure 5: Predicted change in budget share of items across occupational groups



Note: Estimates are based on results presented in Table 3. All figures were adjusted for 2019 prices. The standard error bars represent the 95 percent confidence intervals.

Results from Figure 5 also show that food expenditure share increased the maximum for wage labour households by 9.7 percentage points, followed by agricultural households by 9 percentage points. The share of cereals went down the most for agricultural households and wage labour households by 1.65 and 1.62 percentage points, while the share of cereal complements went up by 2.5 and 2.3 percentage points, respectively. Agricultural households were relatively better off, as the lockdown imposed in March 2020 was relaxed earlier in the rural sector in order to prevent food shortage. This allowed farmers to carry on with their production, with own production of

crops providing an important insurance against the shock perpetuated by the pandemic. Additionally, the food subsidy extended by the government was an important coping mechanism – this also helped non-agricultural households smooth their food consumption.

6 Concluding remarks

The Covid-19 pandemic, and the multitude of lockdown and unlocking phases wreaked havoc on the livelihood of a wide spectrum of households. Our data further show that on average per-capita consumption dropped considerably, although less than the fall in per capita income. Despite the fall, households were able to smooth their food consumption in response to the livelihood shock, primarily backed by the additional food grains subsidy extended by the government. This is particularly evident particularly amongst poorer households, where we observe an increase in food consumption in terms of both cereals (rice and wheat) and cereal substitutes, food items that are consumed along with such starchy cereals, such as vegetables, pulses, oil, etc. 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.

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. However, approximately 21 percent of the entire sample had no food ration card – 72.6 percent of this subset had no access to PDS grains in 2021. Overall, our data 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 32.7 percent of the households in the poorest assets quintile 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, and expanding the food safety net.

Using 2021 data, we further observe that nearly 76 percent of households that drew their income from daily wage labour received PDS subsidies, while 60 percent of those with micro and small businesses did so. What caused the 24.9% of daily wage households and 40 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 better targeting of PDS grains and expanding the food safety net. It also reinforces the importance of 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 provide ease of access to food subsidy and achieve food security.

References

Afridi, F., A. Dhillon and S. Roy (2020). "How has Covid-19 crisis affected the urban poor? Findings from a phone survey." Ideas for India.

Aggarwal, S., D. Jeong, N. Kumar, D. S. Park, J. Robinson and A. Spearot (2020). Did COVID-19 market disruptions disrupt food security? Evidence from households in rural Liberia and Malawi, National Bureau of Economic Research.

Amare, M., K. A. Abay, L. Tiberti and J. Chamberlin (2021). "COVID-19 and food security: Panel data evidence from Nigeria." Food Policy **101**: 102099.

Banks, J., R. Blundell and A. Lewbel (1997). "Quadratic Engel curves and consumer demand." Review of Economics and statistics **79**(4): 527-539.

Basole, A., R. Abraham, R. Lahoti, S. Kesar, M. Jha, P. Nath, R. Kapoor, S. N. Mandela, A. Shrivastava and Z. Dasgupta (2021). "State of working India 2021: one year of Covid-19."

Cameron, L. A. and C. Worswick (2003). "The labor market as a smoothing device: labor supply responses to crop loss." Review of Development Economics **7**(2): 327-341.

Chiappori, P. A., K. Samphantharak, S. Schulhofer-Wohl and R. M. Townsend (2014). "Heterogeneity and risk sharing in village economies." Quantitative economics **5**(1): 1-27.

Choudhuri, P., S. Pramanik and S. Desai (2022). "Urban Exclusion: Rethinking Social Protection in the Wake of the Pandemic in India." NCAER Working Paper, WP 135.

Cochrane, J. H. (1991). "A simple test of consumption insurance." Journal of political economy **99**(5): 957-976.

Deaton, A. (1991). "Saving and Liquidity Constraints." Econometrica **59**(5): 1221-1248.

Dercon, S. (2002). "Income risk, coping strategies, and safety nets." The World Bank Research Observer **17**(2): 141-166.

Desai, S., N. Deshmukh and S. Pramanik (2021). "Precarity in a Time of Uncertainty: Gendered Employment Patterns during the Covid-19 Lockdown in India." Feminist Economics **27**(1-2): 152-172.

Desai, S. and I. Iyer (2016). The Role of Public Distribution System in Shaping Household Food and Nutritional Security. New Delhi, National Council of Applied Economic Research.

Desai, S. and R. Vanneman (2010). "National Council of Applied Economic Research, New Delhi. India Human Development Survey (IHDS), 2005. Inter-university Consortium for Political and Social Research [distributor]." Ann Arbor, MI: 06-29.
Deshpande, A. (2020). "Early effects of lockdown in India: Gender gaps in job losses and domestic work." The Indian Journal of Labour Economics **63**(1): 87-90.
Dhingra, S. and S. J. Machin (2020). "The crisis and job guarantees in urban india." IZA DP No. 13760.
Drèze, J. and A. Somanchi (2021). "The Covid-19 Crisis and People's Right to Food."
Egger, D., E. Miguel, S. S. Warren, A. Shenoy, E. Collins, D. Karlan, D. Parkerson, A. M. Mobarak, G. Fink and C. Udry (2021). "Falling living standards during the COVID-19 crisis: Quantitative evidence from nine developing countries." Science advances **7**(6): eabe0997.
Gupta, A., A. Malani and B. Woda (2021). Explaining the income and consumption effects of covid in india, National Bureau of Economic Research.
Gupta, S., P. Seth, M. Abraham and P. Pingali (2022). "COVID-19 and women's nutrition security: panel data evidence from rural India." Economia Politica **39**(1): 157-184.
Hirvonen, K., A. De Brauw and G. T. Abate (2021). "Food consumption and food security during the COVID-19 pandemic in Addis Ababa." American journal of agricultural economics **103**(3): 772-789.
Josephson, A., T. Kilic and J. D. Michler (2021). "Socioeconomic impacts of COVID-19 in low-income countries." Nature Human Behaviour **5**(5): 557-565.
Kesar, S., R. Abraham, R. Lahoti, P. Nath and A. Basole (2020). "Pandemic, informality, and vulnerability: Impact of COVID-19 on livelihoods in India." Canadian Journal of Development Studies **2021**(42(1-2)): 145-164.
Khamis, M., N. Prakash and Z. Siddique (2012). "Consumption and social identity: Evidence from India." Journal of Economic Behavior & Organization **83**(3): 353-371.
Kim, S., K. Koh and X. Zhang (2022). "Short-term impact of COVID-19 on consumption spending and its underlying mechanisms: Evidence from Singapore." Canadian Journal of Economics/Revue canadienne d'économique **55**: 115-134.
Kumar, A. and V. K. Sonkar (2022). "Determinants and Dynamics of Food Insecurity during COVID-19 in Rural Eastern India." Economic & Political Weekly **57**(10): 43.
Mahmud, M. and E. Riley (2021). "Household response to an extreme shock: Evidence on the immediate impact of the Covid-19 lockdown on economic outcomes and well-being in rural Uganda." World Development **140**: 105318.
Maitra, P. (2001). "Is consumption smooth at the cost of volatile leisure? An investigation of rural India." Applied Economics **33**(6): 727-734.
McKenzie, D. J. (2003). "How do households cope with aggregate shocks? Evidence from the Mexican peso crisis." World Development **31**(7): 1179-1199.
McKenzie, D. J. (2006). "The consumer response to the Mexican peso crisis." Economic Development and cultural change **55**(1): 139-172.
Mishra, S. K., A. Madan and S. Dutta (2021). "Food security during pandemic times: Insights and perspectives from rural Bihar." IGC Report **S-20158-IND-1**.
Morduch, J. (1995). "Income smoothing and consumption smoothing." Journal of economic perspectives **9**(3): 103-114.
Stillman, S. and D. Thomas (2008). "Nutritional status during an economic crisis: Evidence from Russia." The Economic Journal **118**(531): 1385-1417.
Thomas, D. and E. Frankenberg (2007). Household responses to the financial crisis in Indonesia: Longitudinal evidence on poverty, resources, and well-being. Globalization and poverty, University of Chicago Press**:** 517-560.

Townsend, R. M. (1994). "Risk and insurance in village India." Econometrica: journal of the Econometric Society: 539-591.
Udry, C. (1994). "Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria." The Review of Economic Studies **61**(3): 495-526.