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IMPACTS OF IN-KIND TRANSFERS SIZE BOOSTS ON ELIGIBLE FOOD EXPENDITURES IN THE UNITED STATES

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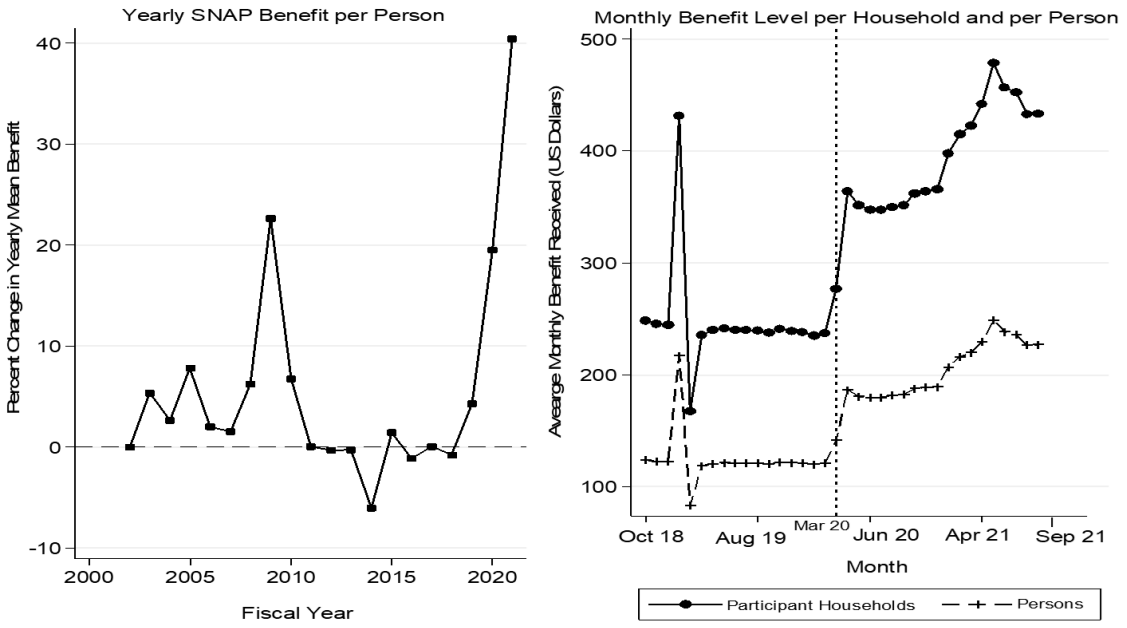
Abstract

This article examines the causal effects from Supplemental Nutrition Assistance Program (SNAP) benefit enhancements on eligible food expenditures, the fiscal years 2020 and 2021 considered. Through a quasi-experimental research design embedded in a difference-in-difference estimation method, the paper uses Consumer Expenditure Diary Survey data to yield interesting results. I find that enrolled households adjust their spending behavior in response to boosts in in-kind transfer. However, on eligible foods, increases in the program allocation levels disproportionately impacted participants spending. Estimates undergone several sensitivity checks which successfully validate their robustness. As policy implication, achieving a more meaningful impact requires food assistance experts to design some threshold of expenses for eligible expenditures.
Keywords: Food assistance, *difference-in-difference method, SNAP, low-income household.*
JEL Codes: C31, D12, Q13, Q18

1. Introduction

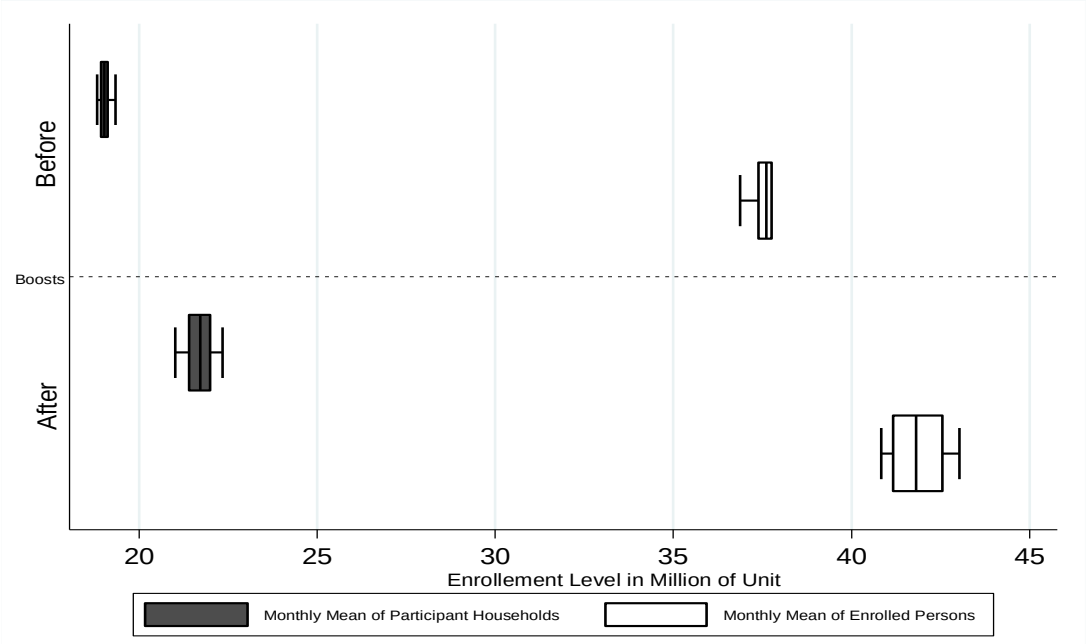
In the United States (U.S.), the Families First Coronavirus Response Act of 2020 (FFCRA) granted the states an approval to deliver Emergency Allotments (EA) to qualified people. Under FFCRA, monthly Supplemental Nutrition Assistance Program (SNAP) benefit amounts per household was improved by at least 95 dollars (Ver Ploeg and Zhen, 2022), effective from April 1 to December 31. Also, the Consolidated Appropriations Act of December 2020 (CAA) expanded by 15% the maximum allotment levels for all SNAP recipients across the whole country. Planned to end in June 2021, the 15% increase was extended to September 2021 under the American Rescue Plan of March 2021 (ARP). As a temporary response, these substantial increases in SNAP allocation correspond to federal measures to handle extreme hardship that several families encountered subsequently to COVID-19 pandemic. More than 41 million persons participated in the program during the fiscal year 2021.

Nonetheless more than half of enrolled households, despite SNAP historical success, reported still experiencing food insecurity (Gundersen et al., 2018). Figure 1 plots the yearly change in benefit received per person. Is also depicted monthly variations in amounts of SNAP allotment received per household, and per person. In accordance with this graph, large rises in allotment levels occur after March 2020 as direct consequence of policies above described. Following the boosts in benefit sizes, enrollment levels also exhibit a jump as evidenced in Figure 2. However, the impacts of these particular enhancements in SNAP allocations had not been covered in economics literature. Especially, at the consumer unit level, the effects of such unprecedent boosts in SNAP benefits on qualified food expenditures remain unexplored to the best of my knowledges. The underlying intend of the current article is then to remove this gap.



Source: Own work of the author with SNAP data from United State Department of Agriculture

Figure 1. Change in Benefit Levels: over 20 Years, on Left, and 3 Fiscal Years, on Right



Source: Own work of the author with SNAP data from United State Department of Agriculture

Figure 2. SNAP Participation Levels Before and After Benefit Increases

Through this paper, my main objective is to investigate the effects induced on eligible food expenditures by recent improvements in SNAP allotments of the fiscal years 2020 and 2021. The first specific objective wants to examine how SNAP participant spending on qualified foods responds to enhancements in benefit amounts while the second is concerned by elucidating how the size of benefit received affects eligible food expenses. Because the SNAP restricts benefit spending to food at home items only, my analysis involves five subgroups of food at home category. Namely, fruits and vegetables; meat, poultry, and fish; dairy products; breads and cereals; and non-alcoholic beverages.

I find that rises in SNAP benefit unevenly impacted eligible foods spending within households. Enhancements in SNAP allocation caused weekly food at home expenditures of participating households to grow by 10.52 dollars on average. Similarly, weekly expenses expand by 2.63 dollars for the food group of fresh fruits and fresh vegetables and by 6.21 dollars for the food category of meat, poultry and fish. Additionally, value of marginal propensity to consume food at home out of SNAP benefit corresponds to 0.21.

Unlike preceding articles, my paper empirically contributes to literature in several ways. First, in providing most importantly evidences on how major SNAP eligible expenditures respond to considerable rise in size of allocations received by beneficiaries, the article adds to consumer economics literature. Second, the work contributes to literature on food policy concerns in demonstrating how SNAP households can modify their food spending behavior next to improvements in food assistance benefits. Lastly, this research updates SNAP literature in covering the most recent event to date of benefit improvements.

The article does not miss to originate policy implications. Accordingly, executive authorities must consider further intensifying the size of benefits while experts must reimagine the way SNAP allowance can be spent on each eligible food category to ensure a more meaningful impact of the food assistance program. The remainder parts of my paper respectively cover related literature in section 2, method used in section 3, empirical results and discussion in section 4. The last section concludes and explains the implications of my work.

2. Related Literature

There is a huge literature available on concerns related to SNAP, formerly known as food stamp program. My approach consists of selecting only the most relevant one for this paper, in such context. I focus on papers which covered impacts of SNAP on expenditures, consumption, and food insecurity as short-term outcomes for participants. Gundersen (2019) studying the role of SNAP in meeting the goal of right to food for everyone, shows that SNAP does ensure a right to food in the U.S. although it only fits some dimensions of such right. He concludes that given the diversity of determinants of food insecurity, one should not anticipate that SNAP will eradicate food insecurity even it is one tool in the U.S. to alleviate food insecurity. Food insecurity is recognized as a major concern in the U.S. like Gundersen & Ziliak (2018) stress it out over a review on the efficacy of food assistance programs and consequences of food insecurity.

Schanzenbach (2019) explores the options to improve the SNAP and argues that potential reforms such as policies to improve dietary outcomes, should be designed with the heterogeneity in demographics of beneficiaries in mind. Gundersen (2021) works on simulating expected outcomes under the scenario of SNAP structured as a Universal Basic Income (UBI) program. To this end, the author uses data from the Current Population Survey and demonstrates that the reduction in food insecurity would be 98.2% at a cost of $564.5 billion in the case SNAP benefits were expanded by roughly 25% and only extended to households with incomes up to 400% of the poverty line. Estimated SNAP results from

Berkowitz et al. (2017) reveals that due to reduced food insecurity, health care expenditures are $1,400 less for participant households than nonparticipants. My article will deduce some policy implications that address inquiries of SNAP improvement.

Some authors signal that despite the success encountered by SNAP, more than half participant households reported still experiencing food insecurity and they suggest expanding the program in term of increase in benefit amount same as granting eligibility to a wider group of households (Gundersen et al., 2018). Other authors argue that such problem subsist because SNAP benefits are not adjusted to reflect difference in food prices across the country (Gundersen et al., 2019). Cuffey et al. (2015) complete a systematic review of the potential impact of SNAP restrictions on expenditures. Their findings suspect an inappropriate use of SNAP benefit because estimates highlighted that if 10 U.S. dollars of benefits would have otherwise been spent, expenses devoted to the SNAP eligible foods would decrease in a range from 1.6 to 4.8 U.S. dollars.

Grindal et al. (2016) use a random assignment of SNAP households to investigate the extend to what food retail access moderate the impact of fruits and vegetables incentives for SNAP households. When the distance to retailers is considered, there is no evidence that the impact of the incentive on SNAP fruits and vegetables spending varies. Rather, for SNAP participants with low and high access to food retailers, such incentive was identically effective as indicated via their results. According to Engel & Ruder (2020), the low intake of fruits and vegetables by SNAP recipients is a persistent challenge. My analysis does not ignore consumption of fruits and vegetables.

An influential paper in the field of impact from SNAP participation on food expenditures is the one of Hoynes & Schanzenbach (2009). These two authors use observational data, Panel Study of Income Dynamic (PSID), to investigate consumption responses to in-kind transfers at the household level. Their estimates illustrate that SNAP participation intensifies overall food expenditures while it diminishes out-of-pocket food spending. Beatty & Tuttle (2014) stepping on a quasi-experimental research design, study at the household level, food at home expenditure response to in-kind transfer too. Unlike the previous, their work analyzes Consumer Expenditure Interview Survey to clarify the impact of benefit increases on SNAP recipients. We see that increases make households to rise their food budget share beyond what theory could predict, the authors mention. My research line up more with Beatty & Tuttle (2014) while providing further insights relative to expenditures for all major SNAP qualified spending instead of food at home budget share.

Todd (2015) shed light on links between diet quality, heterogeneity, and a large boost in SNAP benefit amounts. This author employs observational data, National Health and Nutrition Examination Survey (NHANES) and notice that over the benefit month, increases in SNAP benefit levels could support smooth food intake. Hastings & Shapiro (2018) use retail panel data in combination with semiparametric methods to deduce causal inference. Their work enlightens the effects of SNAP on household expenditure for eligible foods. I will consider major SNAP eligible foods too. Rigorous studies concerned by SNAP impact has relied on inframarginal households and estimated difference-in-difference econometric model (Hoynes & Schanzenbach, 2009; Beatty & Tuttle, 2014; Todd, 2015). This research adopts a similar approach but with some degree of own particularities.

3. Method

3.1 Data

This paper uses the Consumer Expenditure Diary Survey (CEX Diary) data spanning three fiscal years. For instance, 2019, 2020 and 2021. A fiscal year starts from the first day of October in given normal calendar year and ends on the last day of September of the subsequent

year. The CEX Diary is a cross-sectional data gathered quarterly at the household level, the unit of observation. My sample corresponds to the latest release of CEX Diary data, at the time I carry out this study.

Representative for the entire U.S. civilian and non-institutionalized population, the CEX Diary is collected by the Bureau of Labor Statistics (BLS). Permanently accessible from this institution website, the data is available to all public in formats of microdata files. Wide, the range of information gathered includes the purchases made by the surveyed households, involving not only large spending, such as vehicles and property, but also regular spending, such as food expenditures and rents. Additionally, the CEX Diary data provides detailed socio-demographic information such as family size, employment status, race, gender, marital status, age, annual income. Most importantly for my research, CEX Diary contains details on involvement in welfare program, namely SNAP, same as amounts of allowance received.

The process that leads the gathering of information in the CEX Diary can be described as follow. Each quarter, in every sampled household and for two consecutive weeks, the census field representative installs the diary survey booklet. During these time windows, the diary week refers to the seven consecutive days where the respondents record its expenditures. All the diary survey files get organized as quarterly data by assigning every diary week to the quarter under which it has been recorded. It follows that the size of my initial sample covering the three fiscal years is 30,054 observations after I cancel 30 of them with negative value for income before tax. Following a careful consideration of the dataset, I discover that each sampled household was interviewed only once. The number of households equals the total size of observations, thus.

3.2 Analytical Framework

In this paper, the theorical framework I use basically align with Engel's law. This law states that poorer a household is, higher the income share it devotes to food. In opposite, richer a household is, lower its food budget share. The rule assumes that wealth has a negative relationship with food budget share. But it depends on the kind of food too. Concretely, consumption for quality foods such fruits, vegetables, and meat increases with rising income, while consumption of inferior goods such potatoes and cereals falling under the category of basic foods decreases with growing income. Additionally, consistent with Engel's rule, most food products are inelastic goods. Engel's law has authority in the field and has been widely applied in numerous articles, so far.

To relate food expenditure to income at the household level, economists refers to a function called Engel curve. Usually, four functional forms allow to econometrically examine Engel's law. They include double logarithmic, quadratic, semi-logarithmic, and Working-Lesser. The first relates natural logarithm of expenditure to the one of food expenditure while the third exclusively accounts for natural logarithm of income and not of expense. The second involves a quadratic form of income. The late links food budget share to logarithm of income. My research adopts a semi-logarithmic functional form in completing empirical estimations given the data at hand like described in the earlier section.

3.3 Empirical Model

3.3.1 Identification Strategy

To mainly investigate the impacts of recent enhancements in SNAP benefits on eligible major food expenditures at the consumer unit level, my research relies on empirical difference-in-difference approach. This necessitates not only a treatment group, the SNAP participant households, but also a control group of nonparticipants for a comparison purpose. I apply

Coarsened Exact Matching (CEM) procedure following Iacus et al. (2011) to generate a quasi-control group. Thus, my strategy steps on a quasi-experimental approach.

The CEM procedure is a matching on observables method. Such procedure possesses the advantage of improving the balance of observables between treatment and control group. For this article, the CEM method permit to creates a quasi-control group of nonparticipant households and a treatment group of SNAP participants both relatively similar in distribution of covariates. It follows that the matched sample can be taken as good as it was randomly assigned. Implicitly, treatment and control groups are assumed almost alike and differ on observables only by whether or not they are SNAP enrolled. Henceforth, the difference-in-difference method, while allowing to avoid biased estimates, serves to control for unobservable related to seasonality, location, and other global effects.

In coarsening my selected demographic covariates, I apply explicit self-selected bounds. Instead of proceeding directly with exact matching for treatment and control groups, I perform in two steps the technique of self-selected bounds. Next to creating well-defined categories, firstly, I match the households that fall within the same categories, lately. For this purpose, I match observations based on dummies variables such as presence of children, marital status, employment, sex, locality, and race. I also match my sample by involving continuous variables. So, covariate family size is matched using three categories. Explicitly, less than or equal to two, between three and five, and greater than five. I match covariate age after creating five categories. Namely, below 20, between 20 and 35, between 36 and 50, between 51 and 65, and above 65. According to their income brackets, I match the sampled households too. Once the CEM procedure completed, all the unmatched households were discarded.

Table 1 shows the summary statistics of my matched sample. Regarding SNAP eligible foods, participants and nonparticipants exhibit distinct mean expenditures. Mean expenditure tend to be higher for the late compared to the former. SNAP enrolled households tend to have higher family size relative to non-enrolled. This holds for presence of children too. Concerning the reference persons, SNAP participants tend to have lower income, to be younger, unmarried, unemployed, female, and racially balanced compared to nonparticipants.

In the final sample, households are inframarginal pre and post benefit enhancements. Inside my matched sample, I only keep those inframarginal households before to run any regression. This holds for every single SNAP eligible food my research includes. Regardless of the quarter where a household is interviewed, following Beatty & Tuttle (2014), I excluded non-enrolled households with income 150% greater than average income of enrolled households. But before that, I dropped out zero expenditures every time to avoid biased estimates. Percentage of strictly positive expenses corresponds to 53.81 for food at home, 42.82 for subgroup of fruits and vegetables, 38.25 for subgroup of meat, poultry and fish, 41.18 for subgroup of dairy products, 44.29 for subgroup of bread and cereals, and 36.78 for subgroup of non-alcoholic beverages.

3.3.2 Difference-in-Difference Model

Next to all steps above described, I apply a fixed effects difference-in-difference method following Angrist & Pischke (2008). This regression method is a mean to control for unobservable. By implementing this approach, I assume that SNAP participants and nonparticipants households experience parallel trends in eligible expenditures absent the benefit increases policy. Figure 3 gives an initial appraisal of this crucial assumption and provides me with evidences to validate it.

Table 1. Summary Statistics of the Matched Sample

		SNAP Enrolled Households					Non-enrolled Households			
Variable	**Description**	**Mean**	**S.D.**	**Min**	**Max**		**Mean**	**S.D.**	**Min**	**Max**
SNAP Benefit	Monthly Benefit Amount	173.61	182.37	0	2,100					
Food at Home	Expenditure on Food at Home (FAH)	77.78	96.69	0	1,144		96.54	108.09	0	3,242.16
Fruit Veg.	Fruit and Vegetable Expenditure	9.73	16.91	0	312.40		13.02	18.50	0	449.95
Meat Poult. Fish	Spending for Meat Poultry and Fish	16.85	29.34	0	549.18		18.88	37.95	0	3,051.39
Dairy Prod.	Dairy Products Expenses	7.33	10.53	0	111.65		9.71	12.86	0	207.75
Bread Cer.	Expenses for Bread and Cereals	10.12	16.06	0	199.65		12.39	18.21	0	710
Non Alc. Bev.	Non-alcoholic Beverages Expenses	7.96	13.15	0	143.62		9.32	15.28	0	278.59
Food Away	Food away from Home Expenses	25.79	55.20	0	1,051.64		54.58	84.28	0	3,533.22
Income	Annual Income Before Tax	35,047	38,283	200	321,048		92,686	87,398	1	880,147
Family size	Total Members of the Household	2.53	1.76	1	16		2.36	1.42	1	11
Pres. Child	Children Younger than 18 (1=Yes)	0.35	0.48	0	1		0.29	0.45	0	1
Married	Married Reference Person (1=Yes)	0.27	0.44	0	1		0.50	0.50	0	1
Employed	Employed Person (1=Yes)	0.59	0.49	0	1		0.78	0.41	0	1
Female	Female Reference Person (1=Yes)	0.68	0.47	0	1		0.56	0.50	0	1
Age	Age of the Reference Person	52.09	17.28	16	88		53.18	16.93	17	88
Urban	Urban Locality (1=Yes)	0.96	0.20	0	1		0.99	0.12	0	1
Black	Race of Lead Person is Black (1=Yes)	0.20	0.40	0	1		0.05	0.22	0	1
White	Reference Person is White (1=Yes)	0.74	0.44	0	1		0.93	0.26	0	1
Asian	Reference Person is Asian (1=Yes)	0.03	0.18	0	1		0.20	0.13	0	1
Observations		2,021					17,473			

Note: All expenditures are weekly and stated in U.S. dollars. Also, 1=Yes indicates a dummy variable, otherwise 0=No.

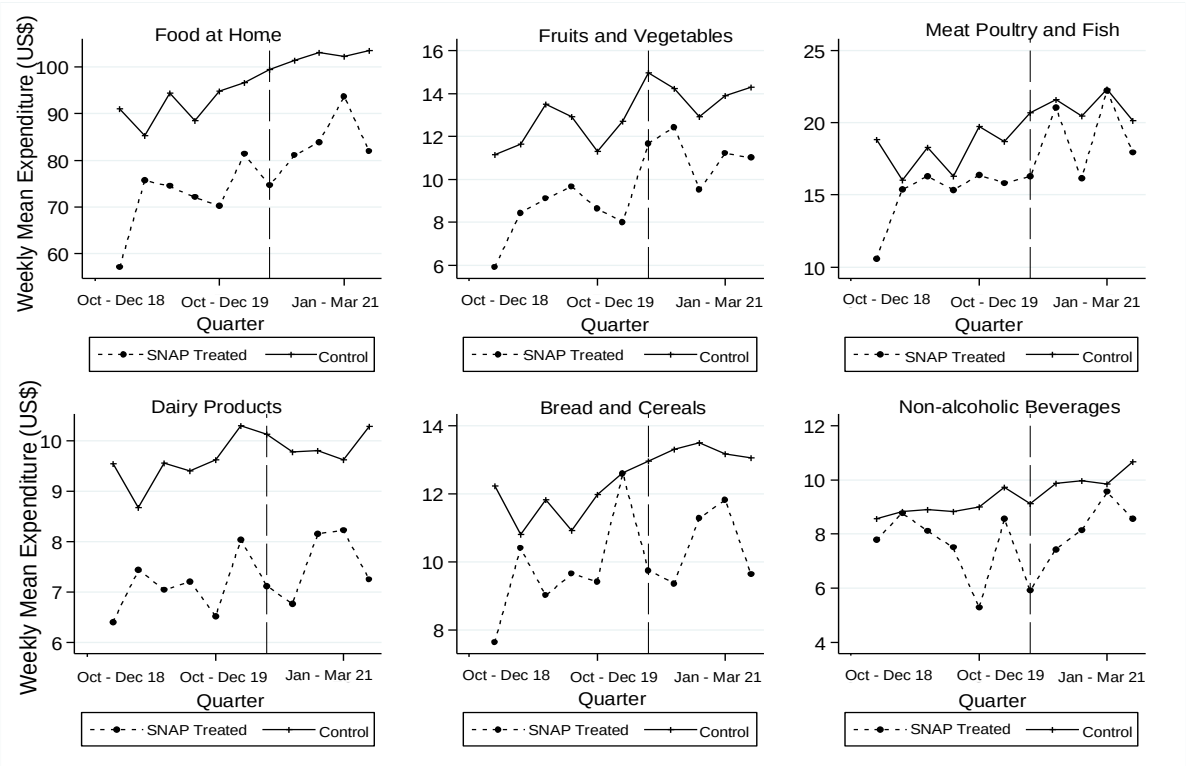
The scheme of my empirical difference-in-difference model begins with referencing each household, h, as SNAP enrolled, $h = 1$, or non-enrolled, $h = 0$. $Expense_{1tj}$ defines the expenditure an enrolled household devotes at a time t on food j while $Expense_{0tj}$ refers to the expense that a non-enrolled household make for same food j. The time reference for policy of benefit enlargements is designated by t which takes the value one in post benefits boosts and zero in pre boosts periods. I define, φ_h, effects linked to time-invariant household characteristics. δ identifies time specific effects encountered by all households. Equation 1 determines food expenditure for a non-enrolled household.

$$Expense_{0tj} = \varphi_0 + \delta * t + \varepsilon_{0t} \quad (1)$$

Accounting for enrolled households in my analysis imposes to incorporate S_h, a SNAP adoption dummy taking the value zero for a recipient household and zero otherwise such depicted in Equation 2.

$$Expense_{1tj} = \alpha S_{1*t} + \varphi_1 + \delta * t + \varepsilon_{1t} \quad (2)$$

where α captures the effect of SNAP benefit on SNAP eligible food expenditure.



Source: Own work of the author with data from BLS

Figure 3. Quarterly Variation in Outcome Variables

Accordingly, Equation 3 portrays the difference in expected value of food expenditures for enrolled households pre and post boosts in SNAP benefit levels.

$$E(Expense_{htj}|h=1,t=1) - E(Expense_{htj}|h=1,t=0) = \alpha + \delta_1 - \delta_0 \quad (3)$$

For non-enrolled households, Equation 4 gives their expected food expenditures.

$$E(Expense_{htj}|h=0,t=1) - E(Expense_{htj}|h=0,t=0) = \delta_1 - \delta_0 \quad (4)$$

Equation 5 shows simple difference-in-difference performed between these two late equations, (3) minus (4).

$$\left[E(Expense_{htj}|h=1,t=1) - E(Expense_{htj}|h=1,t=0)\right] - \left[E(Expense_{htj}|h=0,t=1) - E(Expense_{htj}|h=0,t=0)\right] = \boldsymbol{\alpha} \quad (5)$$

where $\boldsymbol{\alpha}$ indicates the effect of SNAP benefit enhancements on eligible food expenditure for participant households. Table 2 presents my results from implementing such model on my final matched sample.

Table 2. Simple Difference-in-Difference of Sample Mean Expenditure

Variable		(1) **Difference in Difference**	(2) **Difference**	(3) **Pre**	(4) **Post**
Food at Home	SNAP Enrolled	13.30	22.44	83.55 (81.40)	105.99 (112.95)
	Non-enrolled		9.14	84.30 (87.26)	93.44 (93.47)
Fruit Veg.	SNAP Enrolled	2.73	4.60	14.20 (15.20)	18.80 (19.74)
	Non-enrolled		1.87	14.80 (16.57)	16.67 (17.61)
Meat Poult. Fish	SNAP Enrolled	6.75	8.88	24.59 (26.08)	33.47 (40.87)
	Non-enrolled		2.13	24.19 (55.50)	26.32 (29.79)
Dairy Prod.	SNAP Enrolled	1.47	2.11	10.73 (9.99)	12.84 (12.59)
	Non-enrolled		0.64	11.42 (10.86)	12.06 (10.58)
Bread Cer.	SNAP Enrolled	0.31	2.60	13.90 (16.67)	16.50 (18.88)
	Non-enrolled		2.29	13.39 (13.78)	15.68 (20.12)
Non Alc. Bev.	SNAP Enrolled	1.31	2.60	13.15 (12.47)	15.75 (17.61)
	Non-enrolled		1.96	12.87 (12.67)	14.83 (15.81)
Food Away	SNAP Enrolled	6.94	2.84	46.58 (79.11)	49.42 (54.26)
	Non-enrolled		-4.10	61.83 (78.69)	57.73 (62.01)

Note: Standard deviation in parentheses. Expenditures are weekly and stated in U.S. dollars.

This simple difference-in-difference approach depends on sample means comparison. However, such comparison is not free of caveat, for instance the absence of control for econometric confounders including the unobservable. To remediate this imperfection, I apply a regression model based on a semi-logarithmic specification of Engel's curve as illustrated in equation 6.

$$Expense_{htj} = \gamma + \alpha(SNAPHh_{ht} * Postboost_t) + \beta \ln(Income_{ht}) + \delta_t + \varphi_h + \lambda_y + \epsilon_{ht} \quad (6)$$

where α, the average treatment effect on the treated, identifies the DiD (difference-in-difference) point estimate which represents by the same time the coefficient of interest. $Expense_{htj}$, the outcome variable refers to expenditure made on every SNAP qualified food j by household h during quarter t. $Postboost_t$ defines a quarterly dummy variable taking the value of one if household interview occurs after March 2020 and zero if household interviewed before.

$SNAPHh_{ht}$ corresponds to treatment dummy variable that takes a value of one if the household is a SNAP participant at the time of its interview and zero if nonparticipant. $\ln(Income_{ht})$ defines the natural logarithm of total household income before tax. φ_h is household fixed effect and controls for household common shock. λ_y corresponds to fiscal year fixed effect (FY FE) that was included to control for any yearly time invariant influence. δ_t controls for quarterly fixed effects. Lately, ϵ_{ht} is the error term associated to the model. Beyond the discrete specification for dummy variable $SNAPHh_{ht}$, my work also incorporates its continuous specification which considers the natural logarithm for amount of SNAP benefit received. Otherwise stated, I apply a continuous specification of $SNAPHh_{ht}$ on only the interaction term in equation 6 and estimate such equations too. It worth mentioning that I use Ordinary Least Square (OLS) to perform all my estimations.

4. Results and Discussion

In this article, I explore the impacts of benefit enhancements on SNAP eligible expenditures. The current section exposes my findings with regard to measured impacts of benefit improvement policy, relationship between allowance levels and qualified expenditures, robustness checks, marginal effects and elasticity, and discussion.

4.1 Overall Impacts of SNAP Benefit Enlargements

Findings from the sample I analyzed reveal that boosts in SNAP benefit cause the expenditures of two eligible subgroups, in addition to the group of food at home (FAH) in whole, to increase. Fresh fruits and fresh vegetables, the first, same as meat, poultry and fish, the second, are the two subgroups impacted. On average, rises in SNAP benefit induce the households who participated in the program to expand their weekly expenditures by 2.63 dollars on the earlier subgroup of food, and by 6.21 dollars on the late subgroup, with 1% level of statistical significance, holding all else constant. Enhancements in SNAP benefit cause weekly FAH expenditures of the participating households to grow by 10.52 dollars on average all else held constant, with 5% level of statistical significance. For the households that enroll in the program, boosts in SNAP allowance has no statistically significant impact on their weekly expenditures relative to three eligible food subgroups. First, dairy products, second, breads and cereals, and lately non-alcoholic beverages, to indicate them. Table 3 presents the estimation results from equation 6.

Table 3. Discrete Model Estimation Results

Variable	(1) **FAH**	(2) **Fruit Veg.**	(3) **Meat Poult. Fish**	(4) **Dairy Prod.**	(5) **Bread Cer.**	(6) **Non Alc. Bev.**
DiD_discr.	10.52**	2.625**	6.211***	1.028	-0.023	0.536
	(5.142)	(1.179)	(2.178)	(0.677)	(1.047)	(0.972)
Postboost	3.832	2.162***	-0.472	0.0673	1.516***	1.986***
	(2.857)	(0.482)	(2.412)	(0.365)	(0.512)	(0.474)
SnapHh	7.732***	0.371	2.025	0.242	1.724***	0.862
	(2.974)	(0.670)	(1.258)	(0.424)	(0.657)	(0.550)
Log_income	14.370***	1.884***	3.198***	1.509***	1.909***	1.329***
	(1.153)	(0.200)	(0.613)	(0.131)	(0.210)	(0.198)
FY FE	YES	YES	YES	YES	YES	YES
Constant	-67.86***	-4.774**	-10.51*	-4.641***	-6.966***	-1.041
	(11.93)	(2.081)	(6.326)	(1.363)	(2.184)	(2.066)
Observations	10,490	8,348	7,457	8,158	8,633	7,169
R-squared	0.028	0.016	0.008	0.020	0.017	0.013

Note: ***, **, and * denote 1%, 5% and 10% significance levels, respectively. Robust standard errors in parentheses.

The other explanatory variables included in the model also influence weekly expenses on food, as my sample results inform. After the boosts, compared to the period before boosts in SNAP benefit, households amplify their weekly expenditures on fruits and vegetables, breads and cereals, same as on non-alcoholic beverages respectively by 2.16, 1.52 and 1.99 dollars, on average, at the 1% statistical significance level holding everything else constant. SNAP program enrolled households spend, on average, 7.73 and 1.72 dollars respectively more on FAH, and breads and cereals than nonparticipant households at the 1% significance level all else held constant. Because my sample is full of inframarginal households, income effect on each of the analyzed food spending is positive. Moreover, it is statistically significant at the 1% significance level.

4.2 Relationship Between Benefit Levels and Eligible Food Expenditures

Without carrying out contents that elucidate the links between amounts of benefit received by participant households and their expenditures on SNAP eligible foods, the aim of this paper will remain unfulfilled. Received benefit amounts have a positive effect on weekly food spending not only for FAH but also for each of the five food subgroups as my sample results highlighted. This positive effect is statistically significant with 1% level of significance for expenses on FAH and all eligible food subgroups except non-alcoholic beverages which exhibits a 5% level of significance. On average, 1% increase in SNAP benefit amount is associated with 7.77 dollars increase in weekly FAH expenditures for participant households, everything else held constant. This effect corresponds to 1.35 dollars for fresh fruits and fresh vegetables subgroup, and 2.42 dollars respectively for meat poultry and fish subgroup. Similarly, the incidence attains 0.8 dollars for breads and cereals subgroup while it equals 0.6 dollars concerning non-alcoholic beverages.

Under the specification assuming continuous effects of SNAP benefit amounts, boosts, compared to the pre boosts quarters, have a positive influence, statistically significant at the 1% level, on weekly expenditures of three food subgroups. To name them, fresh food and fresh vegetables, bread and cereals, same as non-alcoholic beverages. When accounting for the amount of benefit received, SNAP program enrolled households significantly spend less on

FAH and all eligible food subgroup, in exception of non-alcoholic beverages, than those households who did not. Consistent with the results obtained through the discrete specification of my model, income displays a positive and significant effect, at the 1% level, on weekly expenses relative to all SNAP eligible spending. Table 4 illustrates the results obtained from estimating the continuous specification of my model presented in equation 6.

Table 4. Continuous Model Estimation Results

Variable	(1) **FAH**	(2) **Fruit Veg.**	(3) **Meat Poult. Fish**	(4) **Dairy Prod.**	(5) **Bread Cer.**	(6) **Non Alc. Bev.**
DiD_cont.	7.773*** (1.416)	1.347*** (0.345)	2.423*** (0.639)	0.859*** (0.228)	0.799*** (0.277)	0.590** (0.267)
Postboost	3.956 (2.857)	2.148*** (0.482)	-0.467 (2.411)	0.092 (0.365)	1.530*** (0.513)	1.972*** (0.475)
SnapHh	-31.23*** (7.334)	-5.449*** (1.975)	-7.071** (3.125)	-4.206*** (1.294)	-3.348** (1.514)	-2.288 (1.444)
Log_income	14.44*** (1.155)	1.898*** (0.199)	3.202*** (0.612)	1.518*** (0.131)	1.913*** (0.211)	1.336*** (0.198)
FY FE	YES	YES	YES	YES	YES	YES
Constant	-68.98*** (11.95)	-4.945** (2.081)	-10.62* (6.311)	-4.774*** (1.361)	-7.046*** (2.189)	-1.137 (2.076)
Observations	10,490	8,348	7,457	8,158	8,633	7,169
R-squared	0.030	0.017	0.009	0.022	0.018	0.013

Note: ***, **, and * indicate 1%, 5% and 10% significance levels, respectively. Robust standard errors in parentheses.

4.3 Robustness Checks

Unless the model undergoes a rigorous robustness check, it might be hard to claim the validity of the causal impacts, average treatment effects on the treated, estimated from a difference-in-difference econometric approach. This research relies on two placebo periods to complete its robustness verification, pre and post benefit boosts. By using placebo periods, the goal is to test whether or not my difference-in-difference model exhibits any impact that is statistically significant regardless of the specification, discrete or continuous. The DiD point estimates are not expected to own any statistical significance in order to establish that the policy of SNAP increases induced an impact, in this context.

Otherwise stated, the robustness check allows to test a crucial assumption underlying the difference-in-difference approach requiring treated and control groups to present a similar trend absent the policy evaluated. For this purpose, I separately estimate the model for each placebo period, and under the two initial specifications. Concerning the discrete specification, the analysis excludes dairy products, breads and cereals, as well as non-alcoholic beverages since the policy effects lack of statistical significance for these food subgroups initially. For the remaining eligible food expenditures category scrutinized in this paper, my findings highlight that their DiD coefficient estimates are not statistically significant. This is true for both placebo periods, for instance pre and post boosts. However, the placebo DiD point estimates show smaller magnitudes. Table 5 summarizes the results of robustness tests completed on the discrete model.

Table 5. Robustness Check on the Discrete Model

	(1)	(2)	(3)
Variable	**FAH**	**Fruit Veg.**	**Meat Poult. Fish**
Pre boost			
DiD_discrPre	2.334	-1.663	-0.599
	(5.244)	(1.149)	(2.102)
Constant	-61.00***	-3.819*	-8.728
	(12.18)	(2.100)	(6.359)
Observations	10,490	8,348	7,457
R-squared	0.025	0.013	0.007
Post boost			
DiD_discrPost	7.796	0.840	3.384
	(5.801)	(1.214)	(2.480)
Constant	-64.88***	-4.619**	-10.15
	(12.14)	(2.095)	(6.306)
Observations	10,490	8,348	7,457
R-squared	0.026	0.013	0.007

Note: Regressors include households, quarter, and fiscal year fixed effects same as log of income. ***, **, and * denote 1%, 5% and 10% significance levels, respectively. Robust standard errors in parentheses.

The robustness checks on the continuous specification includes expenses relative to each of the six SNAP eligible foods that this research covers. Table 6 illustrates the results of robustness tests performed on the continuous model.

Table 6. Robustness Check on the Continuous Model

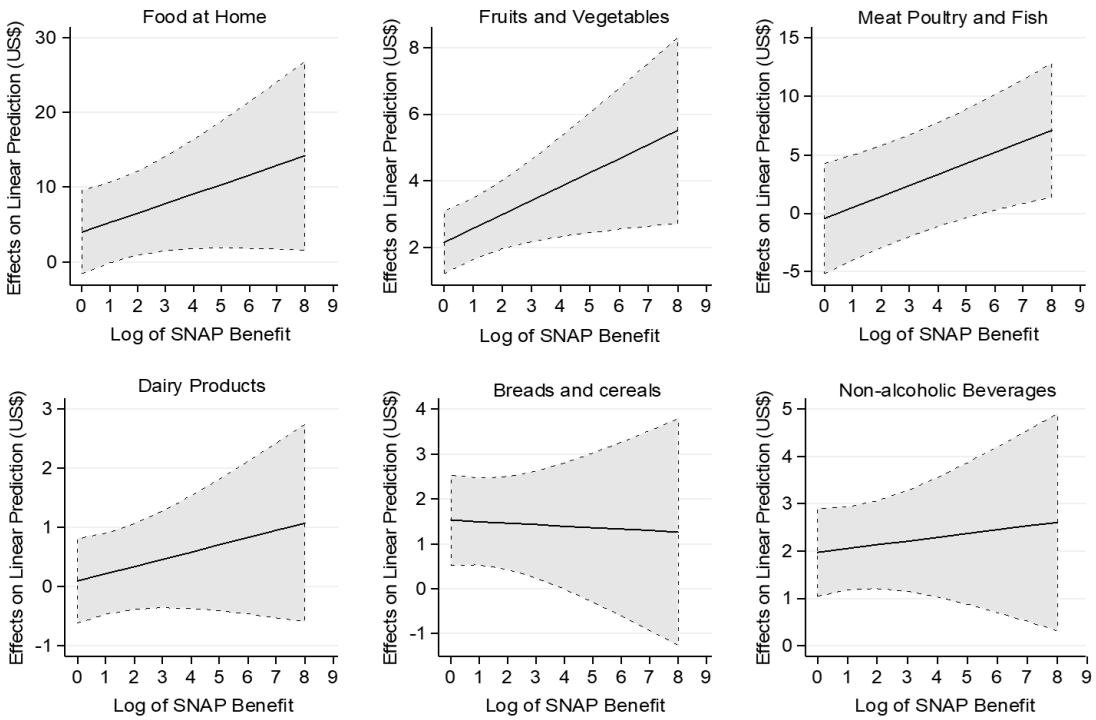
	(1)	(2)	(3)	(4)	(5)	(6)
Variable	**FAH**	**Fruit Veg.**	**Meat Poult. Fish**	**Dairy Prod.**	**Bread Cer.**	**Non Alc. Bev.**
Pre boost						
DiD_contPre	0.914	-0.189	-0.026	-0.006	0.342	0.034
	(0.829)	(0.179)	(0.320)	(0.119)	(0.184)	(0.148)
Constant	-60.88***	-3.773*	-8.702	-4.164***	-5.381**	-0.004
	(12.17)	(2.095)	(6.358)	(1.383)	(2.180)	(2.105)
Observations	10,490	8,348	7,457	8,158	8,633	7,169
R-squared	0.025	0.013	0.007	0.018	0.014	0.010
Post boost						
DiD_contPost	1.624	0.210	0.623	0.203	0.135	0.165
	(0.930)	(0.188)	(0.412)	(0.124)	(0.192)	(0.178)
Constant	-64.74***	-4.593**	-10.06	-4.296***	-6.179***	-0.812
	(12.13)	(2.097)	(6.292)	(1.369)	(2.212)	(2.105)
Observations	10,490	8,348	7,457	8,158	8,633	7,169
R-squared	0.027	0.013	0.007	0.020	0.016	0.013

Note: Regressors include households, quarter, and fiscal year fixed effects same as log of income. ***, **, and * denote 1%, 5% and 10% significance levels, respectively. Robust standard errors in parentheses.

Consistent with my expectations, regressions in these cases yield similar results compared to discrete specification. None of the DiD point estimates are statistically significant when I account for both pre and post boosts placebo periods. Yet, smaller in magnitude the DiD estimates are. Lately, I try to involve food away from home as placebo good in further verifying the robustness of my findings. For this purpose, I account for the discrete model specification only, as the continuous specification might miss relevance here. As expected, the DiD coefficient is not statistically significant since food away is not eligible for SNAP expenditures.

4.4 Predicted Marginal Effects and Elasticity

This paper focuses on examining the effects of recent enlargements in SNAP allocation on major eligible food expenditures. Doing so, I make some analysis regarding the trends of predicted marginal effects same as benefit elasticity of expenditures. The continuous specifications of equation 6 allows this article to achieve such analysis. Figure 4 plots all the predicted marginal effects along with 95% of confidence interval.



Source: Own work of the author with data from BLS

Figure 4. Trends of Estimated Average Marginal Effects

Graphing the trends of marginal effects reveals that households at the extreme bottom range for amount of benefit received spend quasi nothing on meat poultry and fish, same as dairy products. Absent the food assistance program, they are protein insecure. Breads and cereals exhibit a downward trend as prediction plot shows. Higher the amount of SNAP allowance, lower the weekly expenditures that households devote to buy breads and cereals, consequently.

At the upper range for SNAP benefit level, all eligible foods considered, households weekly spend more on meat poultry and fish, about 7 dollars, and on fresh fruits and vegetables, about 5.5 dollars. FAH presents an upward trend over the SNAP benefit range, in accordance with prediction plot. Increasing benefit amounts is associated with higher FAH weekly expenses. This makes sense. Again, the sample is made of inframarginal households.

Elasticity is relevant here since it gives an unitless measure for relative expenditures variation in response to some percentage change in size of SNAP allocations. Table 7 shows computed elasticities.

Table 7. Elasticities

Food Category	**SNAP Benefit Elasticity of Weekly Expenditure**
Food at Home	0.078*** (0.013)
Fruit Veg.	0.0628*** (0.018)
Meat Poult. Fish	0.069*** (0.019)
Dairy Prod.	0.068*** (0.017)
Bread Cer.	0.054*** (0.016)
Non Alc. Bev.	0.039** (0.017)

Note: ***, **, and * denote 1%, 5% and 10% significance levels, respectively. Robust standard errors in parentheses.

Consistent with the inelastic nature of food products, all computed elasticities are less than one. In addition, they are positive and statistically significant at the 1% level, except non-alcoholic beverages, 5% level. 10% increase in amount of benefit received expands the FAH weekly expenditure by 0.78 and by 0.7 not only expenditures for meat poultry and fish but also expenses for dairy products. Further, 10% rise in SNAP allowance drives up weekly expenditures for fruits and vegetables, bread and cereals, and non-alcoholic beverages respectively by 0.6, 0.5 and 0.4. Benefit increases unequally affect subgroups of SNAP eligible foods, thus.

4.5 Discussion

Consistent with previous studies (Beatty & Tuttle, 2014; Hastings & Shapiro, 2018), my findings inform that households modify their spending behavior in response to boosts in in-kind transfer. Enlargements in SNAP benefit of the fiscal years 2020 and 2021 has a significant impact on some but not all eligible food categories. Recipients households improve the healthiness of their diet in heightening the expenditures they devote to fruits and vegetables. Absent the food assistance program, SNAP participants household are protein insecure, as my work point out. I find that household weekly expenditures for meat, poultry and fish has been particularly improved as result of benefit enhancements. Recall, fruits and meat fall under the category of normal good. My findings validate the assumption that better the resources, higher the expenses that households dedicate to improved quality foods, thus. In opposite, it seems that benefit increases I study in this paper are not enough to significantly impact, within participant households, consumption of dairy products, breads and cereals same as non-alcoholic beverages. Consistent with Gundersen et al. (2018), my results imply that SNAP recipient households may still suffering from a kind of food insecurity, therefore.

Following Hastings & Shapiro (2018), I can consider the Marginal Propensity to Consume (MPC) food out of SNAP benefit as ratio of the increase in expenditure to average benefit amounts received by participant households post boosts. The coefficient α, also denoted DiD, from the discrete specification of equation 6 gives estimates of expenditure increase. In average, SNAP enrolled households received 205 dollars of benefit per month according to

my matched sample. I find that MPC food at home out of SNAP benefit equals 0.21. Cleary, MPC defines the increase in spending as result of one additional dollar in benefit amounts. My results line up with Fox et al. (2004) who find estimates of marginal propensity to spend from SNAP that mostly range from 0.2 to 0.4. Similarly, Levedahl (1995) same as Breunig & Dasgupta (2002) find marginal propensity to spend from SNAP respectively equivalent to 0.26 and 0.29. My tentative to compute the ratio for fruits and vegetables gives a value of 0.05 while the one for meat poultry and fish is 0.12.

Finally, my paper has two limitations. First, SNAP benefit amounts may have been under-reported in the CEX Diary data I exploited. But this does not jeopardize the overall quality of my estimates since my analysis undergoes a rigorous approach along with several successful robustness tests. Second, I dropped out all zero expenditures. Keeping them and proceeding with an OLS regression would have undermined the validity of my estimates.

5. Conclusion and Policy Implications

This article investigates qualified food expenditures response to SNAP benefit enlargements at the household level. It rigorously implements a quasi-experimental research design in connection with empirical difference-in-difference approach. Relying on cross-sectional data, the estimates exhibit robustness quality next to several sensitivity checks permitting this research to achieve its overall goal. From this article, two conclusions can be deduced. Consistently with predictions, the results inform that, firstly, households react to boosts in in-kind transfers in adjusting their food spending behavior. Secondly, marginal propensity to consume food at home out of SNAP benefit has a value of 0.21. But eligible foods spending was unevenly affected within participant households. Some SNAP qualified foods expenditures were not significantly impacted, otherwise stated. This includes eligible foods like dairy products, bread and cereals, and non-alcoholic beverages. As implications for policy concerns, it is crucial that food assistance executives consider further expanding the allowance levels for participants since the current policy it not enough to significantly impact every qualified food category. Additionally, food assistance experts need to design distinct threshold of expenses relative to eligible food groups. Such measure will be advantageous in avoiding that participants inappropriately spend SNAP benefit without a balance in healthiness of purchased food. Exploring the impact of benefit size improvements on dietary intake quality and overall welfare of SNAP participant households constitute an avenue for future researches.

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