The Impacts of Online Grocery Shopping with SNAP

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Abstract

Many anti-poverty programs are in-kind, and adoption of new technology can affect how vendors deliver benefits to low-income participants. This project investigates how the availability of online grocery purchasing with Supplemental Nutrition Assistance Program (SNAP) benefits impacts food retailer markets and program enrollment. I find that, by March 2023, 9 percent of all SNAP-authorized stores offered online purchasing, compared to 53 percent of supermarkets and superstores. Then, I use geographic variation in online purchasing availability to estimate impacts on program enrollment using a difference-in-differences design. Analyses suggest that the ability to shop online has null to small effects on county-level SNAP enrollment. This project describes a drastic change in the delivery of nutrition assistance programs and has implications for other in-kind benefit programs.

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1 Introduction

Many anti-poverty programs are in-kind (Currie and Gahvari, 2008). In-kind goods and services are delivered to beneficiaries by either governments or third-party vendors. In the latter case, vendors receive government transfers in exchange for delivering benefits to low-income individuals. For example, hospitals provide healthcare in exchange for reimbursements from public health insurers like Medicaid and Medicare. In the case of food assistance, grocery stores receive voucher payments and provide food products to participating households.

Investments in technology can facilitate these transactions and affect how beneficiaries receive in-kind goods. In this paper, I study how the availability of online grocery purchasing with SNAP (food stamps) affects food retailer markets and households. Beginning in 2019, SNAP households could use their benefits to purchase groceries online instead of in-store in select states and retailers. Like other online shoppers, SNAP participants could then either pick-up their groceries from the store or have them delivered directly to their home for a fee. Online purchasing is perhaps one of the most drastic changes to SNAP's delivery since the program's inception.

First, I describe the rollout of online purchasing with SNAP across stores. The availability of online purchasing expanded substantially with the onset of the COVID-19 pandemic. To accept SNAP payments online, each store needed to coordinate with state agencies, invest in technology to accept their state's SNAP benefit payments online, and apply to the federal government for authorization. Stores' online purchasing adoption is likely endogenous, with stores likely to profit more likely to enter the SNAP online market. Indeed, I find that among all store types accepting SNAP in-person, superstores and supermarkets (rather than smaller food retailers like convenience stores) were most likely to implement SNAP online. 53 percent of all SNAP-authorized supermarkets and superstores accepted SNAP online by the end of March 2023, compared to only 9 of all SNAP-authorized stores. Supermarkets and superstores also accounted for a majority (83%) of SNAP benefits redeemed in the pre-period. This suggests, unsurprisingly, that retailers enter the SNAP online market if

potential profits from entry exceed setup and authorization costs, which is more likely to hold for larger retailers.

In addition, relative to tracts with any SNAP-authorized store, places offering SNAP online shopping are more likely to be urban and have lower population shares of disadvantaged groups. This suggests that SNAP online-availability is likely determined by online shopping availability among the general population, which is generally targeted toward higher-income demographic groups. Thus, SNAP online purchasing availability does not appear to be well-targeted towards areas with low-income, low-access to food stores.

Second, I describe the effects of exposure to SNAP online purchasing on program enrollment. To identify causal effects, I use plausibly exogenous exposure based on geography. Because store authorization was largely at the retailer chain-state level, there is natural variation across geographic areas in the availability of online purchasing with SNAP benefits over time. Across preliminary specifications, I find that online purchasing availability has null to small effects on county-level SNAP enrollment. In counties where more than half of supermarkets and superstores were treated, estimates suggest that enrollment increased by 1 percent. Future work will attempt to disentangle the relevant margins (between attracting new applicants and retaining existing cases) and mechanisms (between disease avoidance, easier budgeting, and decreases in travel costs and stigmatization).

This paper contributes to three broad strands of literature: the impacts of vendor entry and exit on nutrition assistance programs, advancements in voucher payment technologies for in-kind programs, and the effects of remote technologies on public services more broadly. The first strand of literature studies the effects of new SNAP or Women, Infants, and Children (WIC) store authorizations, disqualifications, or closings on program take-up and benefits redeemed (Byrne et al., 2022; Ambrozek, 2021; Meckel, Rossin-Slater and Uniat, 2020). Generally, these papers find effects on participation and benefits redeemed for the WIC program, which has historically had lower take-up and benefit redemption rates, but small to null effects on these outcomes for SNAP. Like these papers, I consider a policy which

alters a household's set of available stores through online shopping and grocery delivery, while simultaneously changing their shopping experience from in-person to online.

A second strand of literature considers the effects of switching nutrition program delivery from using paper vouchers to using state-issued, debit-like benefit cards on stores and households. Currie and Grogger (2001) use state-year variation in availability of these Electronic Benefit Transfer (EBT) cards for SNAP and find no effect on take-up using the Current Population Survey. Using scanner data from an Ohio retailer, Hanks et al. (2019) find that moving to EBT increased WIC benefit redemption rates. Meckel (2020) finds that the transition to EBT reduced WIC participation by reducing the number of stores participating in the program. This paper contributes to this literature by considering a related switch to the method of payment for in-kind programs: from in-person to online EBT redemption.

Finally, this paper contributes to the literature on the impacts of online and remote servicing on public programs more broadly. Other papers consider the effect of online tools and remote services for benefit program application or recertification (Gray, 2019; Wu and Meyer, 2021; Pukelis, 2023). One paper shows the first-stage effects of online shopping availability on SNAP online purchases at the county-level in one state (Foster et al., 2023). To my knowledge, this is the first paper to study the impacts of online grocery purchasing using government-provided vouchers on households' program participation.

The paper proceeds as follows. Section 2 provides background on the SNAP program, the administration of online purchasing, and how purchasing changes for SNAP households when moving from in-store to online. Section 3 provides a brief conceptual framework for how online purchasing availability could affect households, and Section 4 details the data used in empirical analyses. Section 5 provides descriptive results on variation in the rollout of SNAP online purchasing across time and store types. Section 6 describes the empirical strategy for estimating the effect of online availability on SNAP enrollment. Section 7 provides preliminary results on enrollment, and Section 8 concludes.

2 Background

2.1 SNAP overview

The Supplemental Nutrition Assistance Program (SNAP) provides eligible low-income households with vouchers which can be used to purchase food at participating stores. Approximately 1 in 8 individuals in the U.S. receives SNAP benefits.[1] In Fiscal Year 2022, the program distributed a total of $114 billion in benefits. Benefits are issued to households monthly, with an average benefit per person of $230 in Fiscal Year 2022.[2] SNAP benefits account for approximately 11% of all U.S. grocery sales.[3]

2.2 Administration of SNAP

There are three major players in the administration of the SNAP program: the federal government, which oversees the program and provides funding; state governments, which administer the program; and vendors, which deliver the in-kind benefits.

The U.S. Department of Agriculture's Food and Nutrition Service (USDA FNS) is the federal agency which oversees implementation of the SNAP program. The agency sets national standards for program implementation such as baseline eligibility standards for households. FNS also authorizes retailers to accept SNAP benefits in-person and, separately, online. Finally, the federal government provides funding for the SNAP program.

State agencies are in charge of administering SNAP. For example, states receive applications and recertification documentation and make eligibility determinations. Each state has its own Electronic Benefit Transfer (EBT) system and card and issues benefits according to its own monthly disbursement schedule.

[1] SNAP Data Tables https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap

[2] The amount in benefits issued in 2022 is particularly high because of Emergency Allotments: supplemental payments issued following the COVID-19 pandemic. These payments ended in all states by March 2023. For more detail, see Pukelis (2023).

[3] Total SNAP benefits issued in FY 2021 from USDA SNAP Data Tables $108,585.81 million; Total Food At Home Sales in 2021 from USDA Food Expenditure Series: $955,553.56 million.

Vendors, including grocery stores and convenience stores, receive payments through EBT cards and provide food products to customers. To receive SNAP benefits in-store or online, stores must invest in information technology, apply for authorization, and renew authorization. Authorization for online purchasing is separate from authorization for in-store purchasing. In-store authorization is based on requirements to stock specific categories and amounts of staple foods.[4] Authorization for online purchasing requires that a store first meet in-person authorization requirements and also requires that the store has a website with sufficient capabilities to facilitate purchases using SNAP. For example, online stores must ensure only eligible foods can be purchased with SNAP benefits, allow for a separate payment method to be used for non-SNAP eligible items and delivery fees, and allow SNAP customers to choose the amount of benefits that they will use for each purchase.[5]

2.3 Authorization of stores for SNAP online

The 2014 Farm Bill (PL 113-79) mandated a pilot to test the feasibility of allowing retail food stores to accept SNAP benefits online. USDA originally implemented the first online purchasing pilot for SNAP in 2019, starting in the state of New York. In response to the pandemic, the availability of online purchasing with SNAP expanded significantly across states. The federal government invested $5 million in the December 2020 COVID-19 Economic Relief Bill and $25 million in the March 2021 American Rescue Plan to help with the rollout of SNAP online purchasing. In December 2022, USDA announced an additional $5 million would be awarded to further expand online shopping availability, particularly among small, independent retailers.[6]

To accept SNAP payments online, a store must incur upfront, fixed costs in updating payment and online shopping technologies and seeking administrative approval. Specifically, each store needs to invest in technology to accept a state's SNAP benefits online, coordinate

[4] https://www.fns.usda.gov/snap/retailer/eligible
[5] https://www.fns.usda.gov/snap/retailer-requirements-provide-online-purchasing
[6] https://www.fns.usda.gov/news-item/fns-0016.22

with their state agency, and apply to the federal government for authorization to accept SNAP online. Once authorized, a store can accept payments for food items from SNAP participants online. Authorization was largely completed at the retailer-state level, creating natural variation across time and geography in the availability of online purchasing with SNAP benefits.

If a retailer does not run its own pick-up or delivery service, it can contract with an eCommerce platform authorized to provide delivery services for SNAP recipients. Table A.1 lists authorized eCommerce platforms as of May 2023, including Instacart and Doordash. An eCommerce platform can partner with multiple retailers. In this case, both the eCommerce platform and the retailer must be authorized by FNS to accept purchases online.

2.4 SNAP purchasing in-store

SNAP benefits are typically redeemed in-person at an authorized food retailer's store. Benefits can be used to purchase only eligible food items, excluding products like cleaning supplies, alcohol, tobacco, and hot, prepared foods. To redeem their benefits, each SNAP household is issued a state-specific Electronic Benefits Transfer (EBT) card, which looks and acts like a debit card.[7] To make a purchase, a participant must swipe their card and enter a Personal Identification Number (PIN).[8] Any balance exceeding the benefits available on the EBT card or items not eligible for SNAP must be paid for using another form of payment. Some individuals report that transactions using an EBT card take longer than transactions with a typical debit or credit card (Heath, Holcomb and Pukelis, 2022).

If a household does not spend all of its benefits within a single month, its remaining benefits are carried over to the next month.[9] This rarely happens in practice, however, since most households run out of SNAP benefits and reduce their food consumption at the end of

[7] Figure A.1 shows images of EBT cards for all fifty states.

[8] A fictional depiction of redemption of SNAP benefits at a grocery store is shown in Netflix's show *Maid*: https://www.youtube.com/watch?v=jJH5KhfTmTM

[9] There are some restrictions on carrying over benefits if the EBT card is inactive for a whole year. https://ask.usda.gov/s/article/Does-a-balance-on-my-Electronic-benefit-transfer-card-carryover-to-the-next-month.

their monthly benefits cycle (Shapiro, 2005). SNAP households are expended to spend about 30 percent of their net income on food,[10] but households typically do not earmark cash for food beyond their SNAP allotment (Edin et al., 2013). Anecdotally, some individuals take extra time at the register to sort items to purchase in order to limit their food purchases using only their SNAP benefits, especially if they are uncertain about their remaining benefit balance.

2.5 SNAP purchasing online

If available, SNAP benefits can be redeemed online at an authorized food retailer's website. The online grocery shopping experience for SNAP recipients is essentially the same as for other shoppers with two main distinctions. First, SNAP shoppers can view markings online to help them identify qualifying, EBT-eligible food items.[11] Second, SNAP shoppers can use their EBT card for payment online. Like in-store shopping, EBT-ineligible items must be paid for using another form of payment. Figure A.3 shows a screenshot of a purchase using both EBT and debit card forms of payment. The ability to see one's EBT balance and flexibly adjust items in one's online shopping cart likely makes budgeting with SNAP benefits easier online, relative to shopping in-store.

When an individual purchases their groceries online, they will often have the option to select store pick-up or delivery based on store availability. Any fees for pick-up or delivery are not EBT-eligible, so SNAP households must pay for them out-of-pocket. Many retailer chains offer fee reductions or waivers if an order meets a minimum threshold amount, and some offer pick-up or delivery discounts for SNAP recipients.[12]

[10] https://www.fns.usda.gov/snap/recipient/eligibility

[11] See Figure A.2 for a screenshot showing the EBT-eligible mark on one store's website.

[12] The Providers phone application contains information on these offers: https://www.joinproviders.com/.

2.6 Prior changes to the delivery of SNAP benefits

Although a food assistance program existed between 1939 and 1943, pilot programs of food stamp programs began during the Kennedy administration in 1961. During this period, participating households exchanged paper vouchers for food, hence the prior name of "food stamps." In these early years, participants needed to purchase subsidized food stamps from USDA, which they could later exchange for eligible foods at participating retail stores. In 1977, USDA eliminated the purchase requirements for food stamps, facilitating low-income households' access to food support. The elimination of the purchase requirement was the first major change in delivery of food stamp benefits.

The second major change to SNAP purchasing technology was the switch from paper food stamps to the use of EBT cards, which was first authorized in 1990. States began adopting the EBT technology between 1993 and 2003.[13] The effect of the transition from more visible food assistance to EBT cards was studied in Currie and Grogger (2001), and the authors found no detectable impacts on take-up. However, the use of EBT cards still poses some frictions to participants, including one's SNAP status still being visible to the store cashier and others in the check-out line at grocery stores.[14]

The switch from in-person to online grocery shopping is the third major change in delivery of the Food Stamp Program or SNAP. Removing a trip to the grocery store entirely through online shopping is expected to reduce claiming costs during the delivery of benefits more significantly compared to the food stamp-to-EBT transition.[15]

[13] SNAP Policy Database, USDA ERS.

[14] For qualitative evidence of visibility at the grocery store, see Appendix B.

[15] The Women, Infants, and Children (WIC) Nutrition Program has undergone a similar evolution in program delivery in its history. However, WIC's technological advancements in program delivery have largely lagged behind SNAP. In addition, there are fewer WIC-authorized retailers compared to SNAP-authorized retailers nationally. In 2023, USDA FNS announced a proposal to begin authorization of WIC purchases online in the coming months.

3 Conceptual framework: effects of SNAP online on household participation

Allowing online purchasing is expected to increase enrollment by decreasing the costs of receiving benefits through four mechanisms: COVID-19 avoidance, shopping convenience, travel convenience, and decreased stigmatization. First, as the rollout intended, online purchasing allows SNAP participants to receive groceries while substantially reducing the risk of contracting airborne communicable diseases like COVID-19. Second, shopping online is more convenient since SNAP customers can more easily identify SNAP-eligible items and more flexibly budget with respect to their remaining SNAP benefits balance.

Third, online purchasing with delivery increases convenience by eliminating travel costs (in exchange for a fee). This may be especially important for SNAP participants facing transportation and mobility barriers, which are more common among low-income compared to high-income populations. According to a survey conducted in 2012-13, 66 percent of SNAP participants use their own vehicle to purchase groceries, compared to 88 percent of the general population. For the remaining SNAP participants, 21 percent use someone else's car or ride with someone else and 13 percent walk, bike, or take public transit or a shuttle (Ver Ploeg et al., 2015). Thus, mobility barriers are especially important for approximately one-third of SNAP households.

Particularly for households that would otherwise walk, bike, or use public transit to grocery shop, online shopping is likely to expand availability grocery store options and affect shopping behavior. Figure A.4 shows that, compared to households with their own vehicle, households who do not shop with their own vehicle do not travel as far to grocery shop (Ver Ploeg et al., 2015).[16] Specifically, households who walk, bike, or take public transit do not shop more than 0.9 miles aware from home, on average. Meanwhile, 33.6 percent of SNAP recipients lived more than 1 mile from a sizeable grocery store (Rhone, Williams

[16]It also shows that, on average, households do not shop at the grocery store closest to their residence.

and Dicken, 2022). For these kinds of households, the availability of online shopping with delivery can provide additional grocery store shopping options, which could potentially affect the prices of grocery purchases made and the ability to access a wider variety of foods such as fresh produce. Separately, the ability to shop online could affect the quantity and frequency of grocery purchases for these households, since they would not be limited by what they can carry home. Overall, online shopping availability may improve access to food, particularly for SNAP households with mobility barriers.

Fourth, shopping online should result in stigmatization reduction. When shopping in-person, some SNAP participants have reported concerns about stigmatization by grocery store cashiers and other shoppers waiting in line at the store check-out.[17] The availability of SNAP online should then increase enrollment among individuals who previously anticipated stigmatizing experiences when using SNAP benefits publicly at the grocery store by allowing them to avoid such social visibility. Online shopping with SNAP should decrease these four costs of obtaining benefits, thereby increasing SNAP enrollment for some marginal participants.

Empirically, enrollment could increase following online shopping rollout through an "entry" and/or "retention" margin. Through the entry margin, households could be more likely to initially *apply* for SNAP if they anticipate that the costs of receiving food benefits are lower with online shopping. Through the retention margin, households already enrolled in SNAP could be more likely to *participate longer* if the costs of obtaining food benefits are lowered by online shopping. Future work will try to disentagle these channels.

[17] See Appendix B for qualitative evidence of such concerns.

4 Data

4.1 Online shopping information

4.1.1 Aggregate redemption data

I collect aggregate redemption data at the store type-year level from USDA's Retailer Management Annual Reports between 2010 and 2021. I use these data to show evidence of a first-stage; namely that the availability of SNAP online purchasing led to more purchases online using SNAP. I also use these data to provide context on the fraction of SNAP benefits redeemed (spent) at different store types, such as supermarkets and convenience stores.

4.1.2 Online rollout information

I have hand-collected information on the rollout of SNAP online purchasing at the retailer chain-state-month level from USDA's website.[18] For example, one observation tells that in Massachusetts, Walmart began offering online shopping in May 2020.[19] This data contains the universe of all retailers which adopt SNAP online.

4.1.3 Retailer location data

I have publicly available data on the universe of SNAP retail stores and their precise geographic locations from USDA.[20] Using authorization start and end dates, I fix the set of SNAP-authorized retailers as of March 2020 to avoid capturing endogenous entry or exit of stores in response to online shopping availability. Online-only grocery retailers like Amazon are not included in this retailer dataset, since it includes only stores with physical retail locations. The retail store location data also includes the store type for each store (e.g. supermarket, convenience store).[21] Figure A.5 shows SNAP-authorized store locations na-

[18] For additional detail on data collection, see the Data Appendix.

[19] Once stores begin offering online shopping, they do so in perpetuity. In theory, a store could become unauthorized to offer SNAP online, but this does not occur empirically during the study period.

[20] https://www.fns.usda.gov/snap/retailer-locator

[21] More information on store types is in the Data Appendix.

tionwide as of March 2020.

4.1.4 Matching rollout information to retailer location data

To define exposure to online shopping at the local level, I merge the online rollout data to retailer locations using retailer name. The Data Appendix contains further detail on the matching procedure. Observations from the retailer location data matched to the rollout data are marked as offering online shopping, while unmatched observations are marked as not offering online shopping. Conditional on matching, 89 percent of store names match exactly. The remaining observations match by hand-checking with the aid of a fuzzy match.

4.1.5 Amazon Fresh availability data

Since Amazon grocery delivery through Amazon Fresh does not have physical store locations, I separately collect Amazon Fresh delivery availability. Specifically, I query Amazon Fresh's webpage for every U.S. zipcode.[22] Figure A.6a shows the presence of Amazon Fresh delivery availability across the U.S. at the ZIP Code Tabulation Area (ZCTA) level. Generally, Amazon Fresh delivery is only available in major metropolitan areas.[23]

4.2 Tract-level data

I use census tract-level data to describe the characteristics of places exposed to SNAP online purchasing.

4.2.1 Store data collapsed

I match store location data to census tracts and collapse it to create summary statistics at the census tract level. Summary statistics include length of time authorized as a SNAP retailer, type of store, and name of retailer chain.

[22] See the Data Appendix for additional detail.

[23] For comparison, Figure A.6b shows the presence of Whole Foods delivery availability.

4.2.2 Food Access Research Atlas data

I use data from USDA, Economic Research Service's Food Access Research Atlas to describe characteristics of census tracts with SNAP retailers and SNAP retailers offering online purchasing. The Atlas sources information on household vehicle access, family income, and demographics from the 2014-18 American Community Survey to describe areas with low-income households and households with "low-access" to large food stores, including supermarkets and superstores (Rhone, Williams and Dicken, 2022).

4.3 Outcome data

4.3.1 SNAP enrollment

I collect county-month level enrollment data by digitizing publicly available records from individual state agency websites. These data are available from 30 states, representing approximately 80 percent of the SNAP population. The states do not appear to be selected on SNAP take-up rates. The Data Appendix contains additional information on data availability, representation, and selection. SNAP households enrolled at the county-level is the primary outcome, which is available in 28 states.

4.4 Controls

4.4.1 Unemployment data

The unemployment rate is a key control for contemporaneous economic conditions: the primary factor besides policy changes which could affect SNAP enrollment. I collect monthly county-level unemployment rates from the Bureau of Labor Statistics Local Area Unemployment Statistics series.

4.4.2 COVID-19 pandemic data

Enrollment in SNAP may also be affected by the pandemic itself. Therefore, I control for time-varying measures of COVID-19. COVID-19 cases and deaths data at the county-level comes from Opportunity Insights' Economic Tracker database, which sources from the New York Times (Chetty et al., 2020).

4.4.3 Time Period

The analysis time period for the main specifications runs from 2015-2022.

5 Rollout of SNAP Online and First-Stage Evidence

5.1 Rollout of SNAP online

Figure 1 shows the timing of rollout of online shopping for 20 retailers which operate online in the most states. In most states, online grocery shopping was first rolled out through Amazon and Walmart and has since been expanded at other large retailers. Notably, most large retailers expand online groceries nationally all at once, rather than gradually state-by-state. This suggests that, conditional on retailer, the rollout of SNAP online is not endogenous to changing local economic conditions.

All states and DC except Alaska rolled out online purchasing through at least one retailer during the study period.[24] By the end of 2022, fewer retailers were being added month-to-month.

Figure 2a shows the percent of all physical store locations offering online shopping over time. Adoption begins picking up at the beginning of the COVID-19 pandemic. Adoption is approximately linear over time–perhaps due to the capacity of federal government officials to review and authorize stores. By the end of the sample period, 8.75 percent of all SNAP-authorized stores with a physical location offered SNAP purchasing online. Notably, Amazon

[24] Alaska began offering SNAP online at one retailer in June 2023.

is excluded from these statistics since it does not have physical store locations.

Figure 2b shows the percent of all supermarkets and superstores offering online shopping over time. Qualitatively, the graph follows nearly the exact pattern as the graph for all physical stores. However, the magnitude is significantly larger. By the end of the sample period, 52.89 percent of all SNAP-authorized supermarkets and superstores with physical store locations offer SNAP purchasing online.

Figure 3 shows that while supermarkets and superstores make up a small share of all stores that accept SNAP, they make up almost all of the store locations that accept SNAP online by the end of the sample period.[25]

What explains the disproportion share of supermarkets and superstores among online adopters? Figure 4 shows that supermarkets and superstores account for the vast majority of SNAP benefits redeemed. Therefore, for these store types, it is more likely that the benefits of offering SNAP online in terms of redemptions outweigh the upfront authorization costs.

5.2 Describing selection of treated areas

How do places with SNAP online shopping available compare to places with any SNAP-authorized retailer? Table 1 shows characteristics of census tracts in 5 different categories: all tracts, tracts with any SNAP-authorized retailer, tracts with any SNAP-authorized supermarket or superstore, tracts with any SNAP-authorized store offering online purchasing, and tracts with any SNAP-authorized supermarket or superstore offering online purchasing. The table describes the nature of selection of geographies associated with having a store and having a store that offers SNAP online purchasing. The table shows that, relative to tracts with any SNAP-authorized store, places offering SNAP online shopping are more likely to be urban, have higher population shares of Whites, and have lower population shares of disadvantaged groups. Specifically, tracts offering SNAP online have lower shares

[25] Figure A.7 shows the fraction of stores in each store-type category.

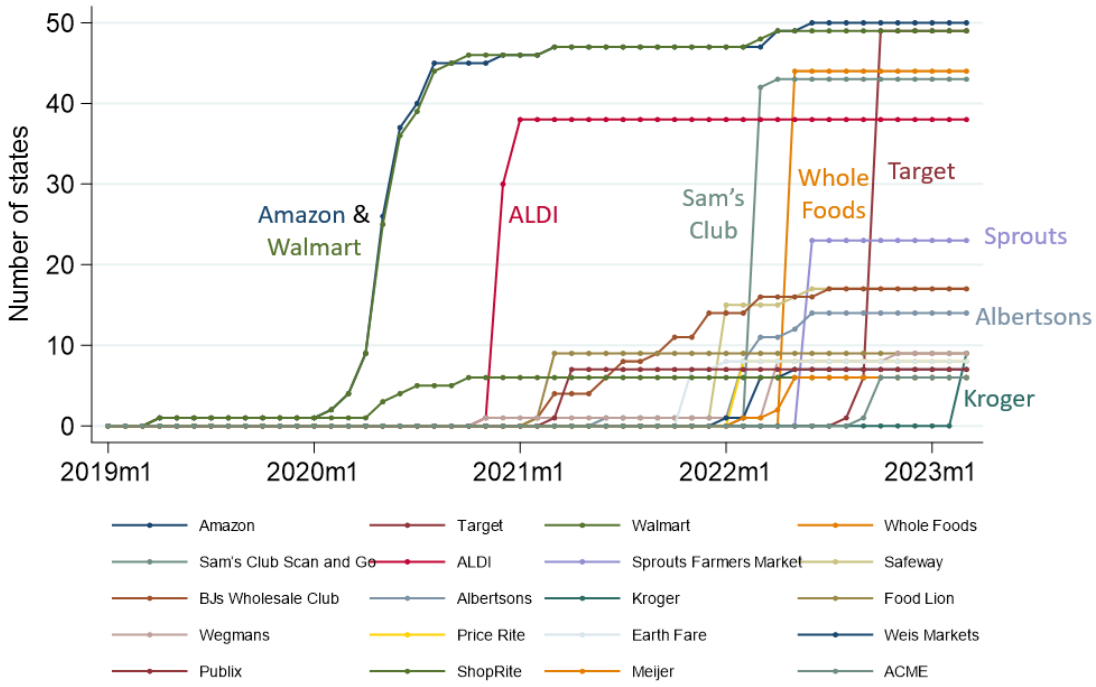
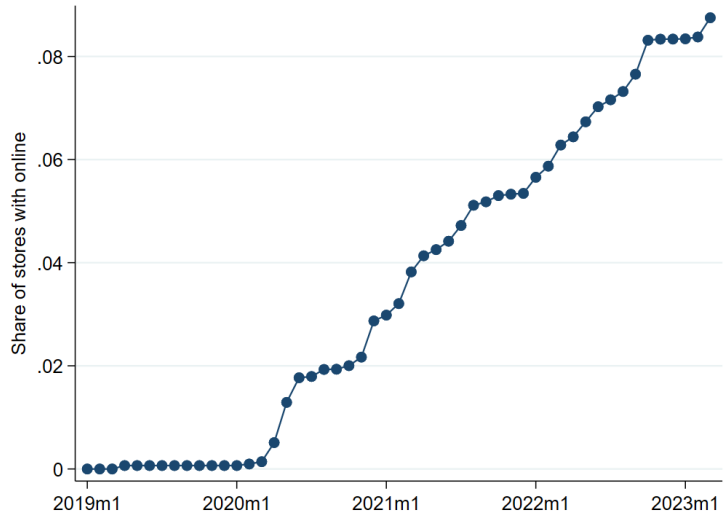
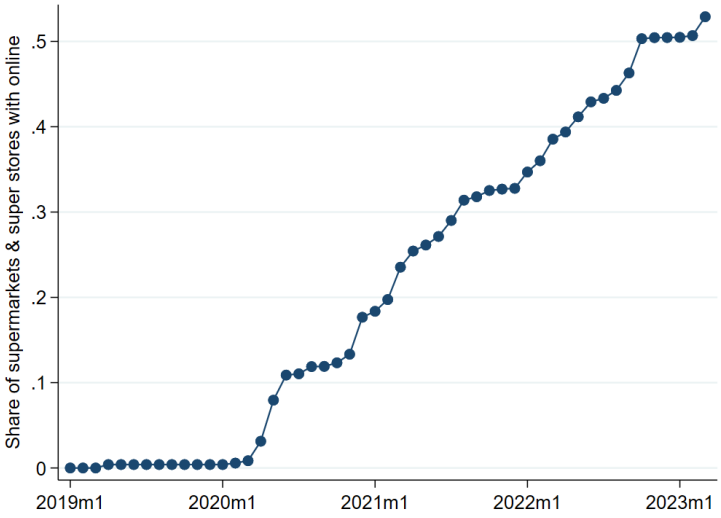


Figure 1: Rollout of SNAP Online: 20 Large Retailers

Notes: Figure includes 20 retailers which operated online in the most states by the end of the study period. *Source*: Author's coding of information from https://www.fns.usda.gov/snap/online-purchasing-pilot over time.



(a) All Physical Stores



(b) All Supermarkets & Superstores

Figure 2: Rollout of SNAP Online

Notes: Excludes Amazon, which does not have physical store locations.

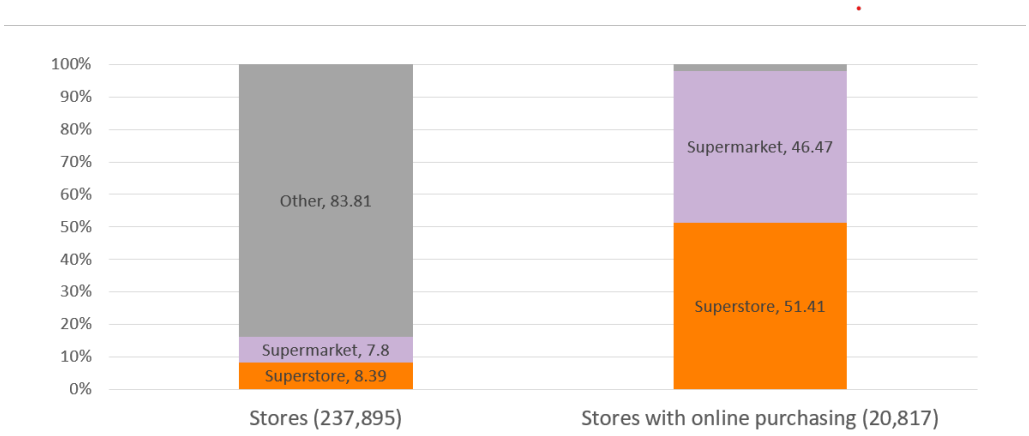


Figure 3: Majority of stores with SNAP online are Supermarkets & Superstores

Notes: Excludes Amazon, which does not have physical store locations.

of Blacks, Hispanics, low-income individuals, SNAP recipients, and households with a vehicle compared to either all census tracts or compared to tracts with a SNAP-authorized store. This suggests that SNAP online-availability is likely determined by online shopping availability among the general population, which is generally targeted toward higher-income demographic groups. Thus, while SNAP online purchasing may have the potential to address access barriers among immobile populations, its current potential to do so may be limited by the propensity for retailers to focus online purchasing availability in higher-income areas. In short, SNAP online purchasing availability does not appear to be well-targeted towards areas with low-income, low-access to food stores. Further work will take this selection into account for the main empirical design.

Variable	All tracts	Any SNAP store	Any SNAP supermarket/store	Any SNAP store online	Any SNAP supermarket/store online
Number of stores	2.8867	3.3185	4.2337	4.1851	4.427
Number of stores online	0.2456	0.2823	0.6328	0.8822	0.9547
Years store open (mean)	10.4307	10.4617	10.0073	10.2817	9.2068
Years store open online (mean)	1.0012	1.0042	0.9769	1.0212	0.991
Has a store of the following type:					
Supermarket	0.3282	0.3281	0.4284	0.6804	0.4939
Superstore	0.3234	0.3235	1	0.6819	1
Has a store of the following retailer:					
Walmart	0.1088	0.1089	0.3363	0.3336	0.5494
Aldi	0.047	0.0469	0.1026	0.1439	0.1426
Whole Foods	0.0113	0.0112	0.0347	0.0348	0.0567
N: store data	73,782	64,182	20,818	20,539	12,733
Urban	0.7606	0.7574	0.8232	0.823	0.8153
Low-income population share	0.3361	0.3489	0.322	0.3126	0.315
Kids population share	0.2341	0.2355	0.2348	0.2319	0.2335
Seniors population share	0.1363	0.1354	0.1363	0.1403	0.1374
White population share	0.7187	0.7148	0.7414	0.7508	0.7588
Black population share	0.1384	0.1425	0.1096	0.1122	0.11
Asian population share	0.044	0.0417	0.0502	0.0466	0.0437
Other race population share	0.0989	0.101	0.0988	0.0903	0.0875
Hispanic population share	0.1527	0.157	0.15	0.1392	0.1315
Share housing units without a vehicle	0.0962	0.0986	0.0874	0.076	0.0762
Share housing units receiving SNAP	0.1353	0.142	0.1231	0.1167	0.1171
Low access (1 mile)	0.3359	0.3266	0.3505	0.379	0.3965
Share of SNAP housing units w/ low access (1 mile)	0.2291	0.2259	0.1581	0.1503	0.1505
N: Food Access Atlas data	72,531	64,059	20,785	20,504	12,713

Table 1: Selection of Places with Online Shopping Available

Notes: Underlying data is at the Census Tract Level. Store data is collapsed from the store location-level to the Tract Level. Food Access Research Atlas data from USDA, uses 2010 Census Tract boundaries.

5.3 First-stage impacts of availability on online purchasing

To what extent do SNAP households utilize online purchasing after it becomes available? I currently do not have micro-data available to estimate the first-stage impacts of online shopping availability on online purchases at a granular level. However, I have gathered publicly available, aggregate evidence to show that SNAP online availability led to an increase in online purchases using SNAP benefits.

First, based on Google Trends data, interest in SNAP online appears to have peaked at the onset of the COVID-19 pandemic and remained elevated. Figure A.8 shows that search terms associated with SNAP online shopping ("ebt online", "amazon ebt", and "instacart ebt") sharply increased at the beginning of the pandemic. The prevalence of these search terms also remained elevated relative to the pre-pandemic period. Meanwhile, search terms associated with SNAP more broadly ("snap online" and "snap apply") also peaked early in the pandemic but decreased more quickly to near-pre-pandemic levels. These data suggest that demand for online grocery shopping with SNAP remains present, despite the end of the public health emergency associated with COVID-19.

Several datasets confirm that a sizable fraction of SNAP participants have grocery shopped online, but online shopping is still less frequent among SNAP participants compared to the general population. Figure 5 shows that about 17 percent of SNAP households shopped online in early 2023, compared to 23 percent of the general population in 2021. Furthermore, Figure 4 shows that in FY 2021, 3.96 percent of all SNAP redemptions occurred online (the internet retailer category).[26] Meanwhile, online purchases account for 12 percent of all grocery revenue for the general population (FNS, 2023).

Overall, aggregate evidence shows that grocery shopping online is less prevalent among SNAP participants compared to the general population. Take-up of online purchasing in SNAP may be relatively low because (1) some households lack SNAP online availability in

[26]Statistics from USDA corroborate evidence of a first-stage effect on online shopping utilization. Figure A.9, created by USDA, shows that the share of SNAP and P-EBT benefits redeemed online grew from virtually 0 percent in February 2020 to approximately 2.3 percent in September 2020.

their local area; (2) some households are not aware that they can use SNAP benefits online; (3) some households would like to shop online, but pick-up and delivery fees are prohibitive; (4) some households would like to shop online, but internet access is unavailable or unreliable; or (5) only a limited number of SNAP households value online shopping.

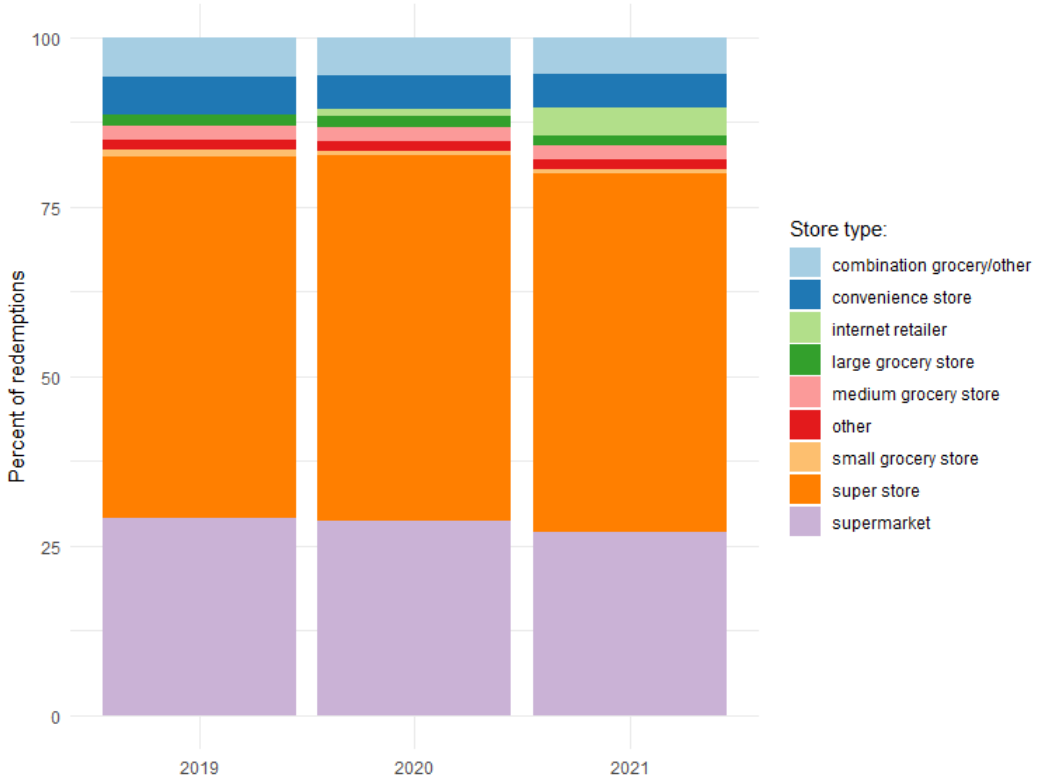


Figure 4: First-stage: Online Redemptions Increased

Notes: In FY 2021, 3.96 percent of all SNAP redemptions occurred online ("internet retailer"). See the Data Appendix for a detailed definition of "internet retailer." Years are Fiscal Years.
Source: SNAP Retailer Management Annual Reports

6 Empirical Strategy

To estimate the impacts on households' SNAP enrollment, I use a difference-in-differences research design where the treatment is the availability of online grocery purchasing for SNAP within a county.

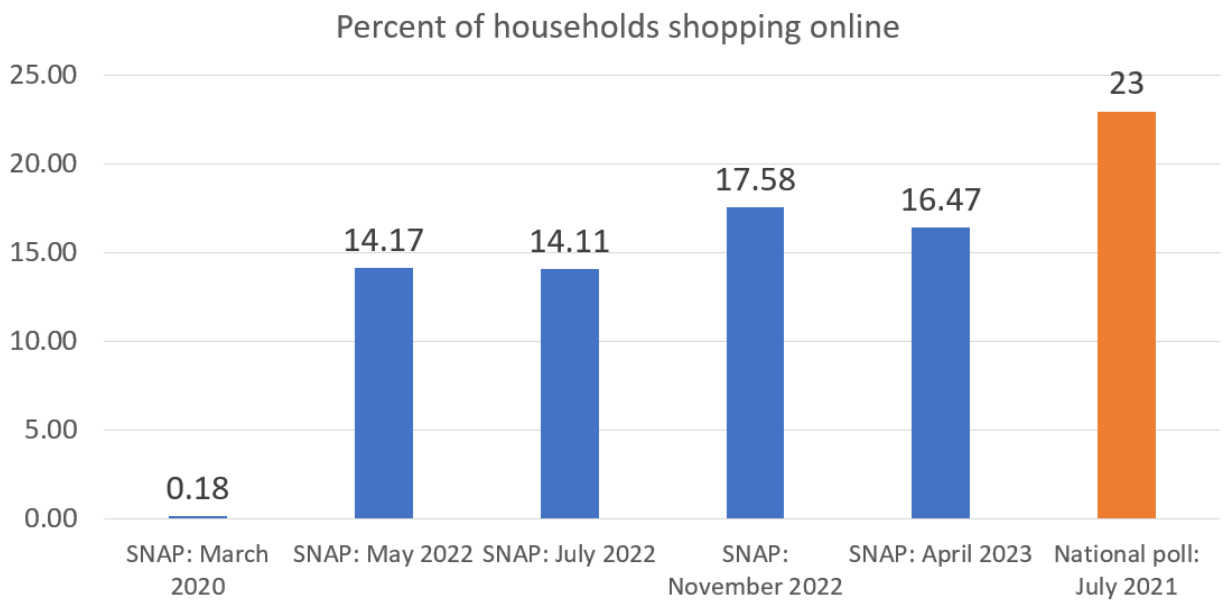


Figure 5: First-stage: More SNAP households are shopping online

Source: Numerators from USDA press releases. Denominators from SNAP Data Tables. National poll data from Gallup's July 6-21 Consumption Habits survey. Available online at https://news.gallup.com/poll/353090/grocery-shopping-online-fewerdining.aspx

6.1 Defining treatment at the county-level

A household's exposure to online shopping depends on three factors: (1) which stores they live close to, (2) if those retail chains implemented online purchasing with SNAP, and (3) if a household spends most of its benefits at those store types. I use these factors to guide how to define treatment at the county-level.

First, USDA provides precise store locations. If I had a precise location for a SNAP-eligible household, this would allow me to define treatment based on distance between residence and store. Because the enrollment outcome is defined at the county-level, however, I define online availability as the *fraction* of relevant stores in the county which implemented SNAP online by the end of the sample period.

Second, merging the store location data to the online rollout data provides complete information on stores' adoption of SNAP online.

Third, I showed that the vast majority of SNAP spending occurs at supermarkets and

superstores. Therefore, I define online exposure based on only supermarkets and superstores, excluding all other store types.

Altogether, I define online availability at the county-level as the fraction of supermarkets and superstores within the county which implemented SNAP online by the end of the sample period. I define a county as first-treated the month that *any* supermarket or superstore in the county offers online shopping with SNAP benefits. Figure A.10 shows the distribution of first-treated dates at the county-level. Some counties (mostly rural) do not have a single supermarket or superstore, so they are excluded from the analysis (9 percent).

Figure 6a shows the distribution of treatment at the end of the sample period. Most counties have at least some exposure to SNAP purchasing online at the end of the sample period. There is bunching at round fractions because many counties only have 2 or 3 superstores (see Figure A.11).

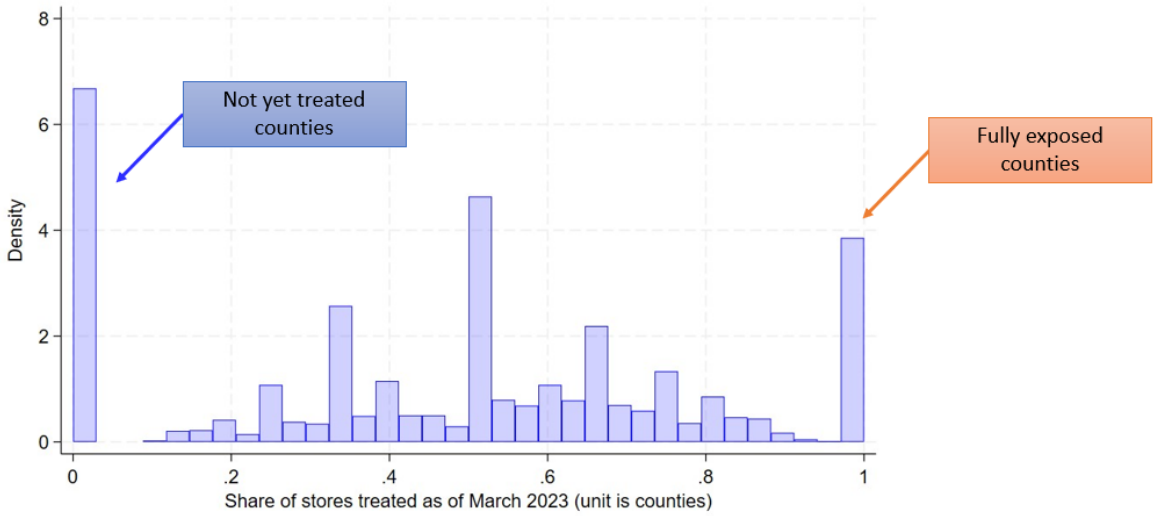
Figure 6b shows the variation in treatment intensity across counties. There appears to be substantial geographic variation of the availability of SNAP online, even within a given state.

6.2 Empirical specification

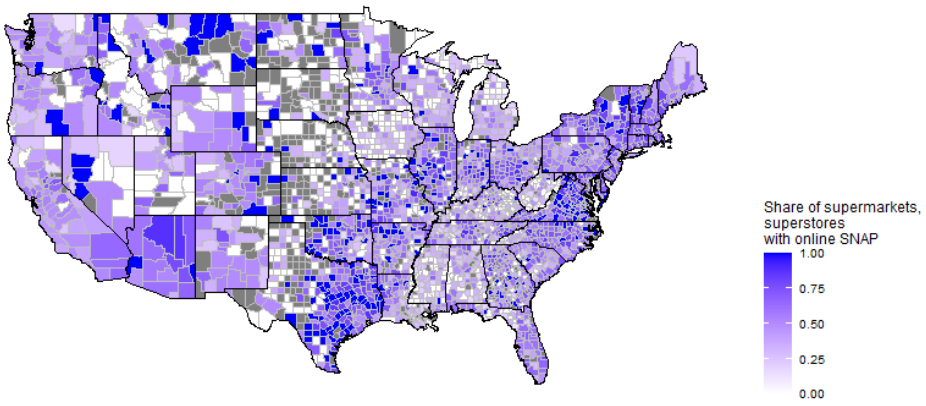
The empirical approach is an event-study using first exposure to SNAP online with county and state-year-month fixed effects:

$$Y_{cst} = \sum_{r \in [\underline{r}, \bar{r}] \setminus \{-1\}} \beta_r \cdot \mathbf{1}(r = R_{cst}) + X_{cst}\boldsymbol{\pi} + \alpha_c + \delta_{st} + \varepsilon_{cst}$$

Y_{cst} is log of households enrolled or share of stores online in county c, state s, and year-month t. R_{cst} is the time relative to the first exposure to SNAP online. X_{cst} are county, time-varying covariates, including the unemployment rate and COVID-19 case and death rates. County fixed-effects, α_c, capture time-invariant county characteristics that affect SNAP enrollment, such as demographic characteristics. State-month fixed effects, δ_{st}, flexibly capture state



(a) Histogram



(b) Map

Figure 6: County-level exposure to SNAP online

Notes: Gray counties are those that do not have a single supermarket or superstore authorized to accept SNAP (9% of counties in sample states).

trends, including the effects of other (pandemic-related) policies implemented at the state-level. Standard errors are clustered at the county level. The coefficients of interest are β_r: the percent effect of online exposure on SNAP enrollment r months after first exposure.

7 Results: The effects of online purchasing availability on SNAP enrollment

Figure 7a shows the "first-stage" event study plot for the adoption of online shopping for SNAP in at least one supermarket or superstore. This plot is mechanical and shows the trajectory of the share of superstores offering SNAP online purchasing. Counties initially have no online shopping; when they have online shopping offered for the first time, approximately 25 percent of stores offer it, on average. This fraction remains approximately flat through the end of the period, rising to about 30 percent. Although mechanical, this plot portrays the trajectory of treatment intensity over time for the full sample.

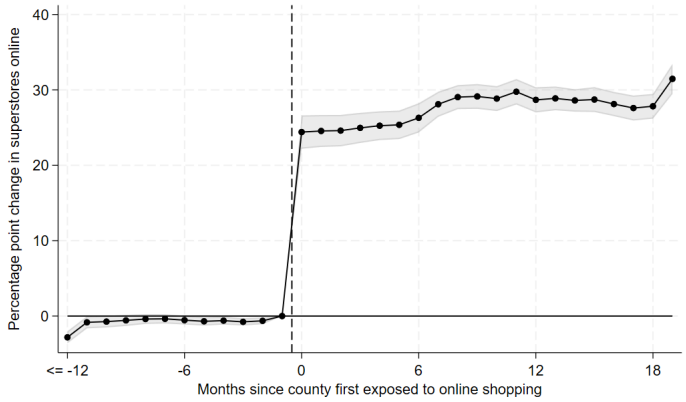
Figure 7b then shows the reduced form specification: the effect of any SNAP online availability on household enrollment. The plot shows parallel trends, up until the first two months before online adoption. For counties adopting online, SNAP enrollment was rising relative to counties not adopting SNAP online, on average. Therefore, there may be some endogeneity in the timing of SNAP online adoption. Enrollment rises approximately nine months into the post period, but the estimates are not statistically significant. The changes in enrollment observed over time could be due to either (1) dynamic effects on enrollment, conditional on treatment intensity or (2) changes in treatment intensity in the post-period.

To try to isolate the dynamic effects on enrollment, I replicate the event study plots for counties with *only one* supermarket or superstore. For this subsample, changes in enrollment observed in the post-period can only be attributed to treatment effect dynamics since all stores (i.e. one store) are treated (see Figure 8a). A drawback of limiting to this sample is that counties with only one superstore are rural counties, so the results may not be

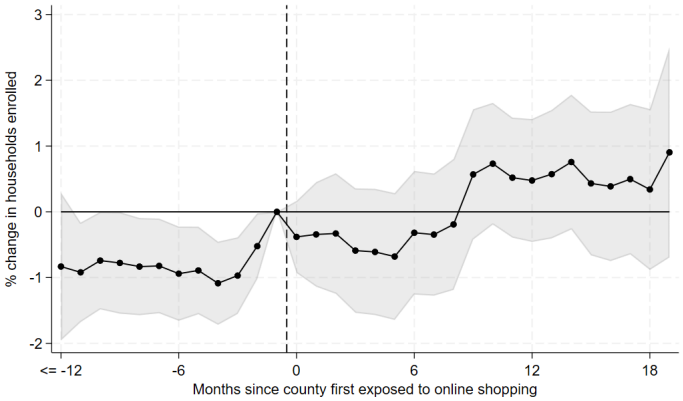
representative of suburban or urban counties. The sample size is also substantially reduced. However, the treatment definition–the share of supermarkets and superstores treated within a county adopting SNAP online–is likely more meaningful for these kinds of rural counties compared to urban counties (with many store options). With these caveats in mind, Figure 8b suggests that online shopping leads to a steady growth in SNAP enrollment over time. The magnitude of the effect by the end of the period is also quite large compared to the effect in the full sample.

To further separate the effect of treatment intensity, Figure 9 splits treated counties by treatment intensity at the end of the sample period. Figure 9a shows the first stage; indeed, more treated counties have a higher share of stores online, but not by a substantial difference. If online shopping exposure indeed increases enrollment, then post-period enrollment in the counties treated more should be higher than enrollment in the counties treated less. Figure 9b does not show evidence of this pattern since less treated counties appear to experience *higher* enrollment increases compared to more treated counties. However, enrollment trends between the two groups are otherwise indistinguishable. This provides inconclusive evidence that additional exposure to online shopping induces larger enrollment effects. There remains more to be explored about selection of counties with SNAP online, in order to make more suitable quasi-experimental comparisons.

Table 2 summarizes the estimates. The "online share" columns indicate the size of the first stage, and the "households enrolled" columns show the reduced-form effect: the effect of online shopping availability of enrollment. The first column indicates that any superstore offering online shopping has a positive, significant effect on enrollment: making online shopping available in the county increases SNAP enrollment by an estimated 1 percent. Column 2 shows the average treatment intensity: in treated counties, 30 percent of their stores offer online shopping in the post-period, on average. Naively scaling the reduced form estimate by the first-stage estimate suggests that offering online shopping across *all* stores in a county would increase SNAP enrollment by 3.4 percent. Columns 3 and 4 split treated



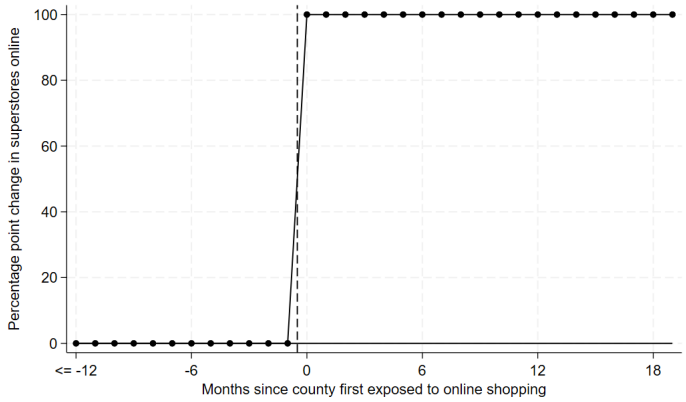
(a) First Stage: Share of Stores with SNAP online



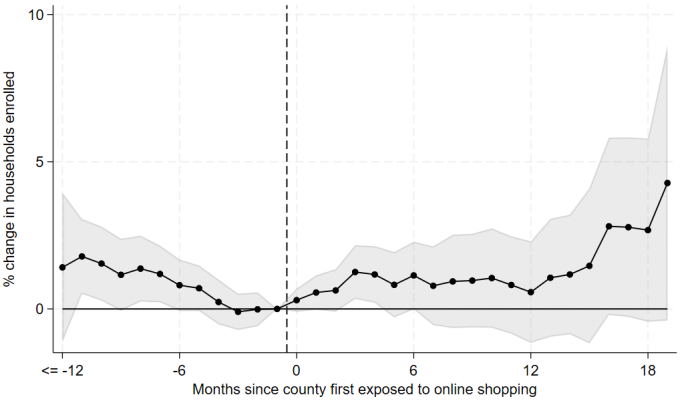
(b) Reduced Form: Household SNAP Enrollment

Figure 7: Event Study: Effects of Online Shopping for Full Sample

Notes: Both panels include the full sample of counties with at least one supermarket or superstore. Panel (a) shows the first-stage effects on the share of superstores offering SNAP online. Panel (b) shows the reduced-form effects on log household SNAP enrollment. Event time is relative to the first month any supermarket or superstore in the county implemented SNAP online. Underlying specifications include controls for the unemployment rate and COVID-19 case and death rates at the county-level, county fixed effects, and state-time fixed effects. Standard errors clustered at the county level.



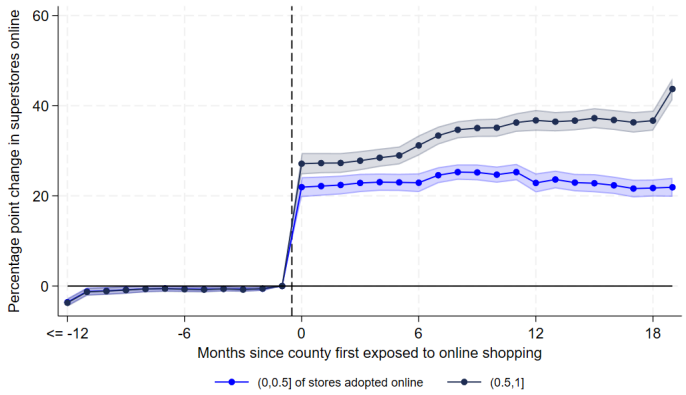
(a) First Stage: Share of Stores with SNAP online



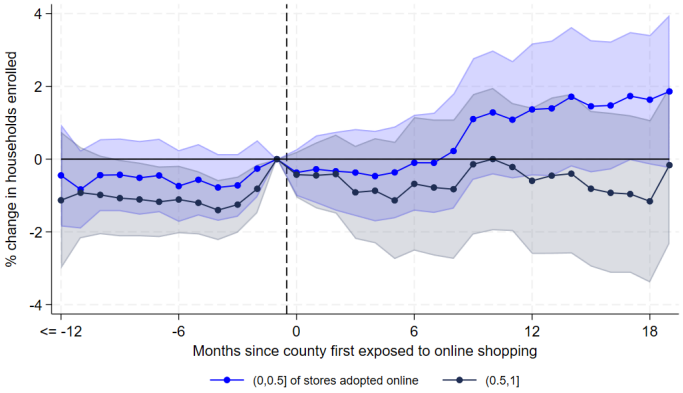
(b) Reduced Form: Household SNAP Enrollment

Figure 8: Event Study: Effects of Online Shopping for Counties with One Store

Notes: Both panels include the sample of counties with only ONE supermarket or superstore. Panel (a) shows the first-stage effects on the share of superstores offering SNAP online. Panel (b) shows the reduced-form effects on log household SNAP enrollment. Event time is relative to the first month the supermarket or superstore in the county implemented SNAP online. Underlying specifications include controls for the unemployment rate and COVID-19 case and death rates at the county-level, county fixed effects, and state-time fixed effects. Standard errors clustered at the county level.



(a) First Stage: Share of Stores with SNAP online



(b) Reduced Form: Household SNAP Enrollment

Figure 9: Event Study: Effects of Online Shopping by Treatment Intensity

Notes: Both panels include the full sample of counties with at least one supermarket or superstore. The graph splits treated counties into two groups: "(0,0.5] of stores adopted online": counties with non-zero but half or less than half of stores with SNAP online by the end of the sample period; and "(0.5,1]": counties with more than half of stores with SNAP online by the end of the sample period. The control group are counties which never adopted SNAP online. Panel (a) shows the first-stage effects on the share of superstores offering SNAP online by treatment intensity. Panel (b) shows the reduced-form effects on log household SNAP enrollment by treatment intensity. Event time is relative to the first month any supermarket or superstore in the county implemented SNAP online. Underlying specifications include controls for the unemployment rate and COVID-19 case and death rates at the county-level, county fixed effects, and state-time fixed effects. Standard errors clustered at the county level.

counties into those that are more or less treated, as measured at the end of the sample period. Again, if online shopping exposure indeed increases enrollment, then post-period enrollment in the counties treated more should be higher than enrollment in the counties treated less. The specification results, however, suggest the opposite. Despite a higher level of treatment intensity in more treated counties (38 versus 24 percent), enrollment gains are not larger in more treated counties. In the last two columns, the sample is limited to counties with only one superstore. These estimates also find an insignificant effect on households enrolled (Column 5), despite these places being fully treated throughout the post-period (Column 6). Overall, these estimates are merely suggestive, with further refinement and robustness checks needed in future work.

	Full sample	Full sample	Full sample	Full sample	Counties with one store	Counties with one store
	Households enrolled (1)	Online share (2)	Households enrolled (3)	Online share (4)	Households enrolled (5)	Online share (6)
Online available	0.0102*	0.3005***			0.0039	1.000
	(0.0056)	(0.0087)			(0.0148)	(0.0000)
Online less available share $\in (0, 0.5]$			0.0141	0.2386***		
			(0.0093)	(0.0092)		
Online more available share $\in (0.5, 1]$			0.0049	0.3835***		
			(0.0127)	(0.0113)		
Unemployment rate	0.0144***	-0.0101***	0.0143***	-0.0084***	0.0065***	
	(0.0029)	(0.0013)	(0.0028)	(0.0011)	(0.0025)	
R-squared	0.9957	0.9031	0.9957	0.9209	0.9661	1.0000
N	167,165	167,165	167,165	167,165	25,245	25,245
Unique counties	1,842	1,842	1,842	1,842	276	276

Table 2: Estimates of the Effect of Online Shopping Availability

Notes: Columns 1-4 use the full sample of counties with a supermarket or superstore. Columns 5-6 use only counties with one supermarket or superstore. "Households enrolled" is log of households enrolled in SNAP. "Online share" is the share of supermarkets and superstores which offer SNAP online in a given month. "Online available" is a dummy variable if any supermarket or superstore in the county offers SNAP online in a given month. "Online less available" is a dummy for offering SNAP online in a given month, for counties which end the period with half or fewer supermarkets or superstores treated. "Online more available" is a dummy for offering SNAP online in a given month, for counties which end the period with more than half of (super)stores treated. All specifications include controls for the unemployment rate and COVID-19 case and death rates at the county-level, state-month fixed effects, and county fixed effects. Standard errors are clustered at the county level.

8 Conclusion

This paper documents the rollout of the availability of SNAP purchasing online and provides preliminary estimates of its effect on SNAP enrollment. Supermarkets and superstores were more likely to become authorized to accept SNAP payments online, compared to other types of retail stores. In particular, more than half of all SNAP-authorized supermarkets and superstores adopted SNAP online by the end of the sample period, compared to only 9 percent of all types of stores. The disproportionate entry of supermarkets and superstores into the online market is likely because SNAP participants redeem a large majority of their benefits at these store types.

In preliminary specifications, I find null to small effects of online shopping availability on SNAP enrollment. Further work will refine the empirical approach and test the robustness of these results, in part by incorporating advancements from the difference-and-difference literature (e.g. de Chaisemartin and D'Haultfoeuille (2022)).

Even if the availability of online shopping has minimal effects on enrollment, there may be other effects of the policy on shopping behavior and grocery purchases among adopting households. Future work will investigate these broader range of potential impacts of SNAP online purchasing.

Online purchasing with SNAP benefits is arguably one of the the most significant changes to the delivery of SNAP–the U.S.' largest nutrition assistance program–in its modern form. Fully understanding its impacts on vendor markets and households has implications for the delivery of in-kind benefits broadly.

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A Appendix Figures and Tables

Figure A.1: Electronic Benefit Transfer (EBT) Cards for Fifty States

Source: Images retrieved from https://www.fns.usda.gov/snap/online-purchasing-pilot

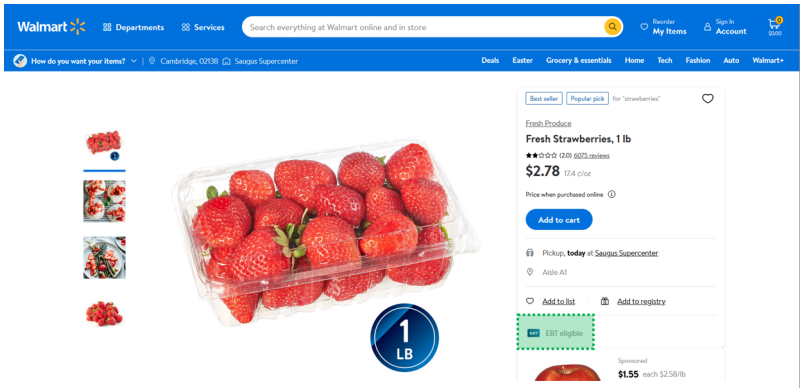


Figure A.2: Grocery shopping online screenshot

Notes: Green box highlighting EBT eligibility added.
Source: Screenshot retrieved from http://www.walmart.com

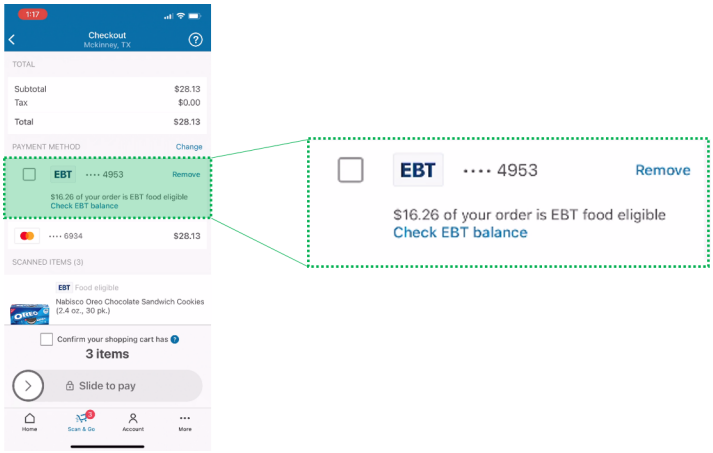


Figure A.3: Online payment screenshot

Notes: Green box highlighting EBT eligibility added.
Source: Screenshot retrieved from https://corporate.samsclub.com/newsroom/2022/03/08/theres-even-more-to-love-about-scan-go-shopping-now-offering-more-member-convenience-and-accessibility-with-ebt

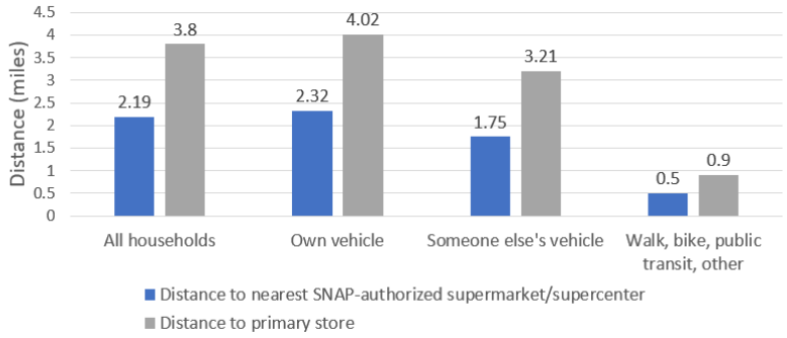


Figure A.4: Average household does not grocery shop at closest store

Notes: Broken down by primary method of travel to grocery store.
Data Source: Ver Ploeg et al. (2015)

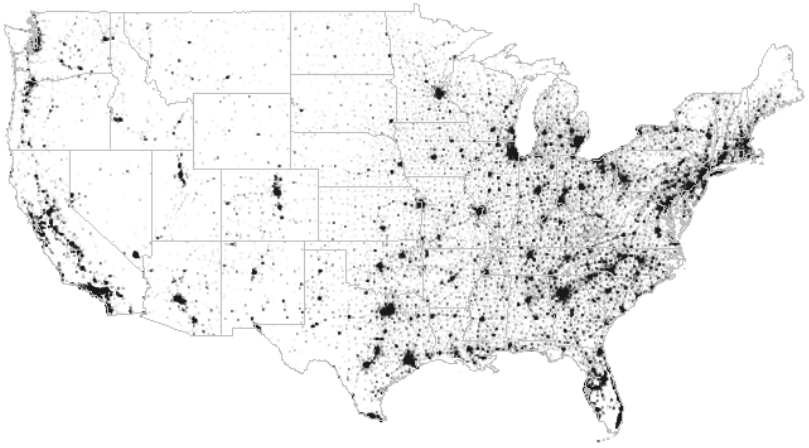
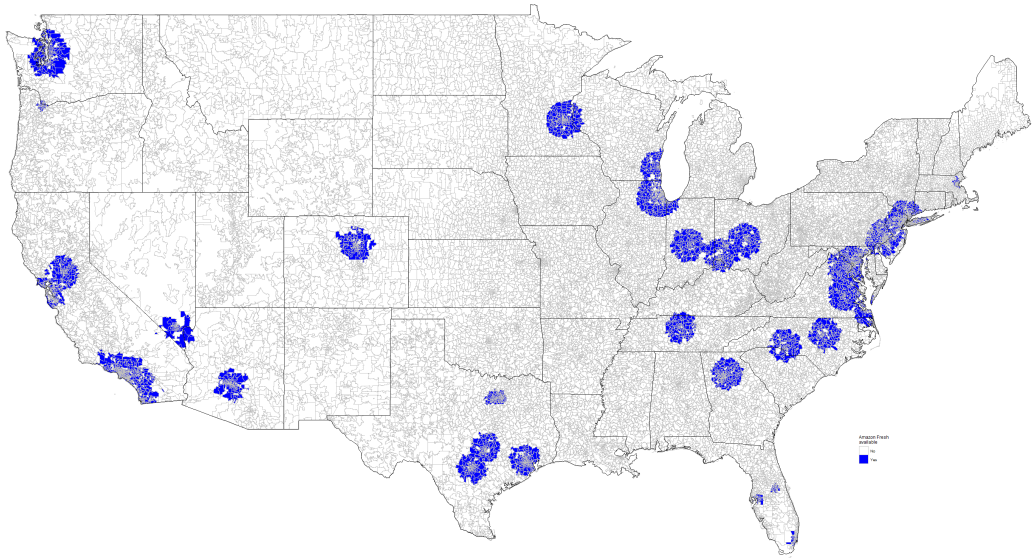
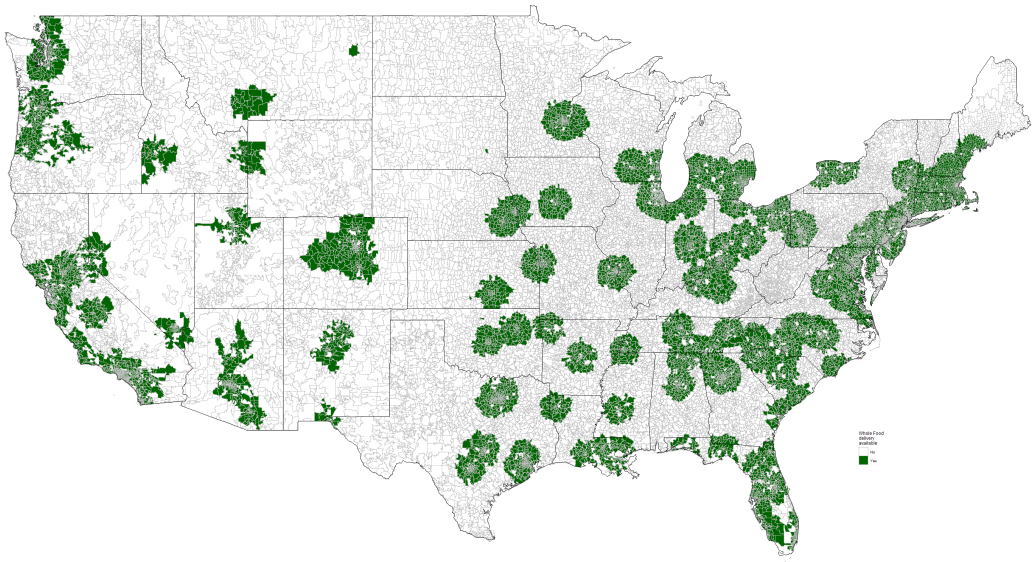


Figure A.5: SNAP Retail Store Locations as of March 2020

Source: https://www.fns.usda.gov/snap/retailer-locator



(a) Amazon Fresh



(b) Whole Foods

Figure A.6: Availability of Amazon-affiliated grocery delivery by ZCTA

Notes: Plotted at the ZIP Code Tabulation Area (ZCTA) level.
Source: Queried from Amazon's webpage.

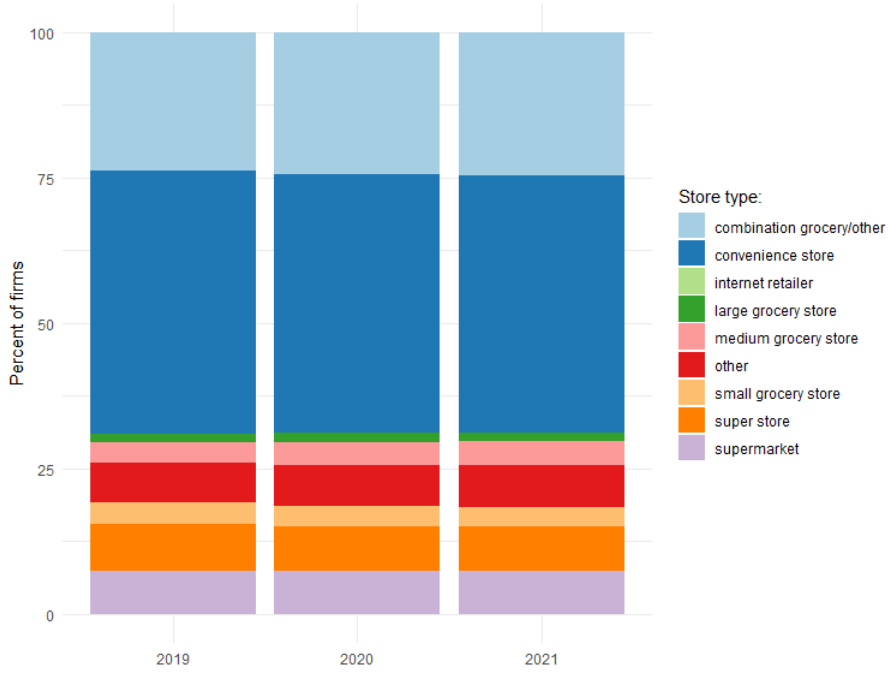


Figure A.7: Stores accepting SNAP, by store type

Source: Data from USDA Retailer Management Annual Reports and Year End Summaries.

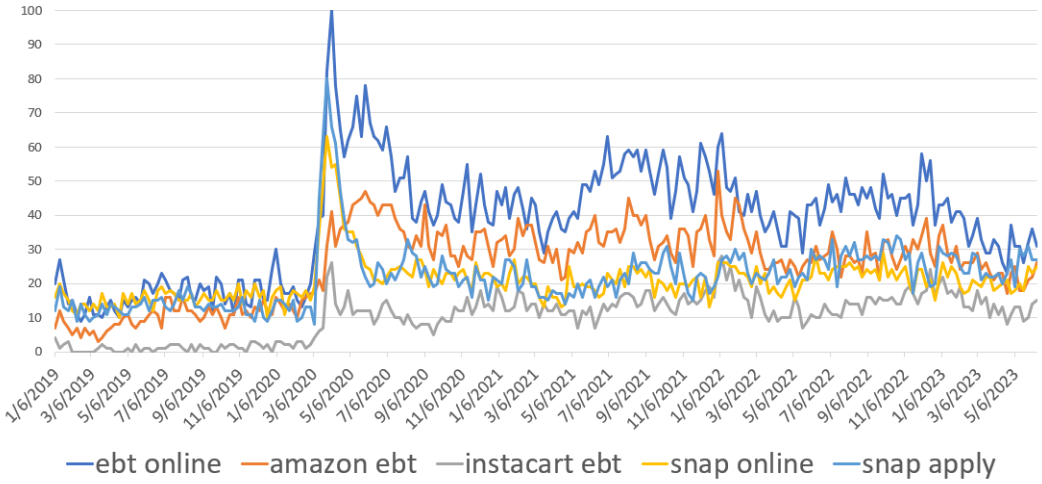


Figure A.8: Interest in SNAP online: Google Trends

Source: https://trends.google.com/trends/explore

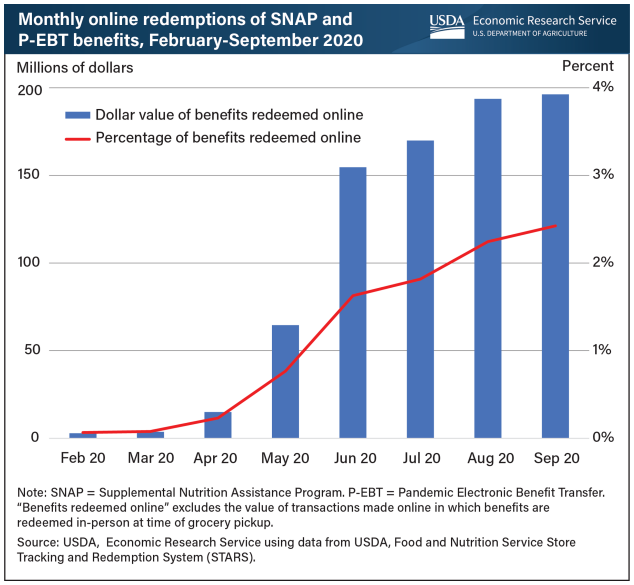


Figure A.9: Monthly online SNAP and P-EBT redemptions grew early in the COVID-19 pandemic

Notes: Statistics include both SNAP and P-EBT redemptions.
Source: Figure retrieved from https://www.ers.usda.gov/webdocs/charts/100945/FED-CWP_online_redemptions.png

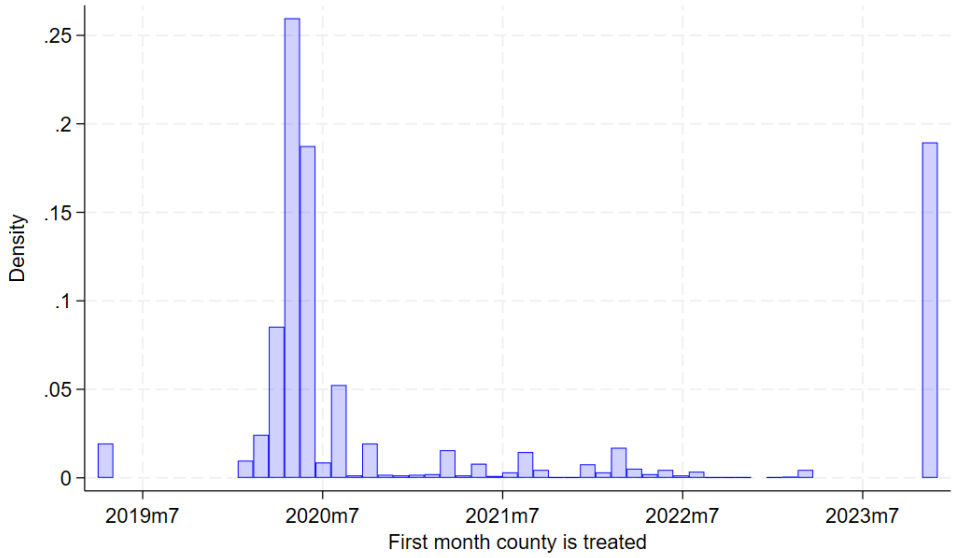


Figure A.10: Most counties are first treated in early COVID

Notes: The right-most bar shows not-yet-treated counties.

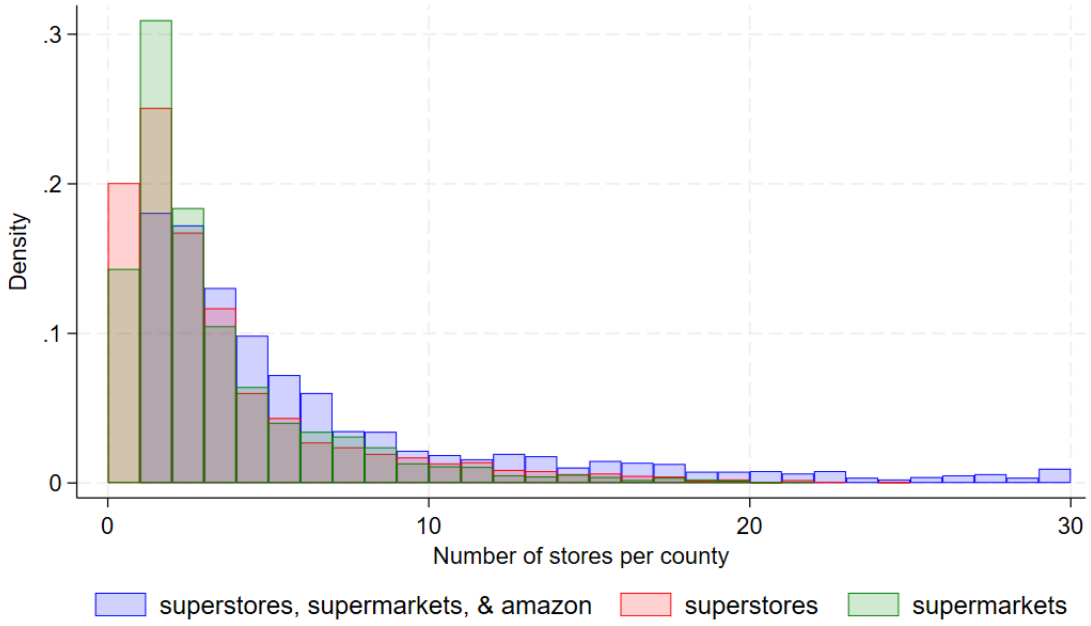


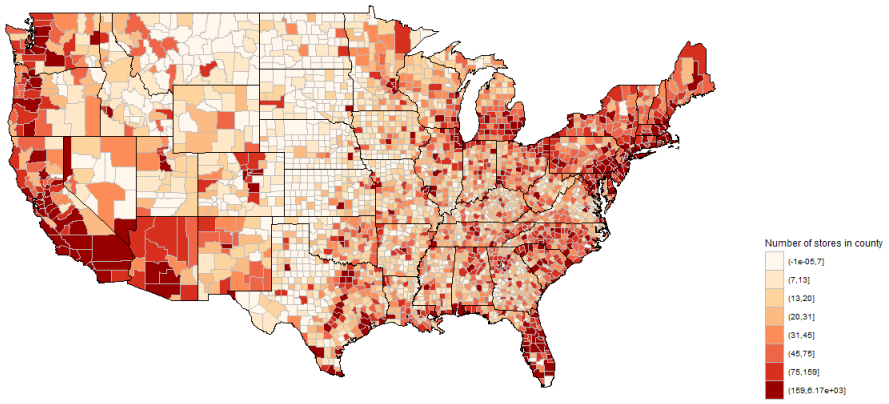
Figure A.11: Most counties have few superstores

Source: https://www.fns.usda.gov/snap/retailer-locator

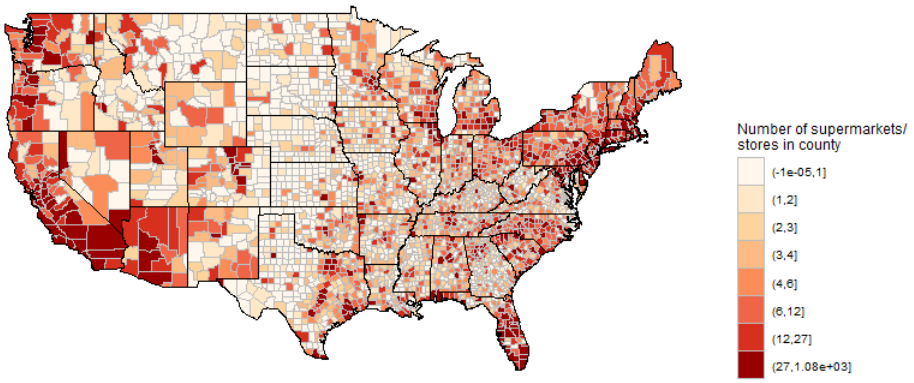
Always On Grocery / RSA America
DoorDash
eGrowcery
Grocerist
Instacart
Local Express
Mercato
Mercatus
NCR Freshop
Point Pickup Technologies
Rosie, an Instacart Company
Stor.ai
Vroom Delivery

Table A.1: eCommerce Platform Providers

Source: https://www.fns.usda.gov/snap/ecommerce-platform-providers Accessed 05/13/2023.



(a) All store types



(b) Supermarkets and Superstores

Figure A.12: SNAP Retail Store Locations as of March 2020 - County-level

Source: https://www.fns.usda.gov/snap/retailer-locator and Amazon data (b only).

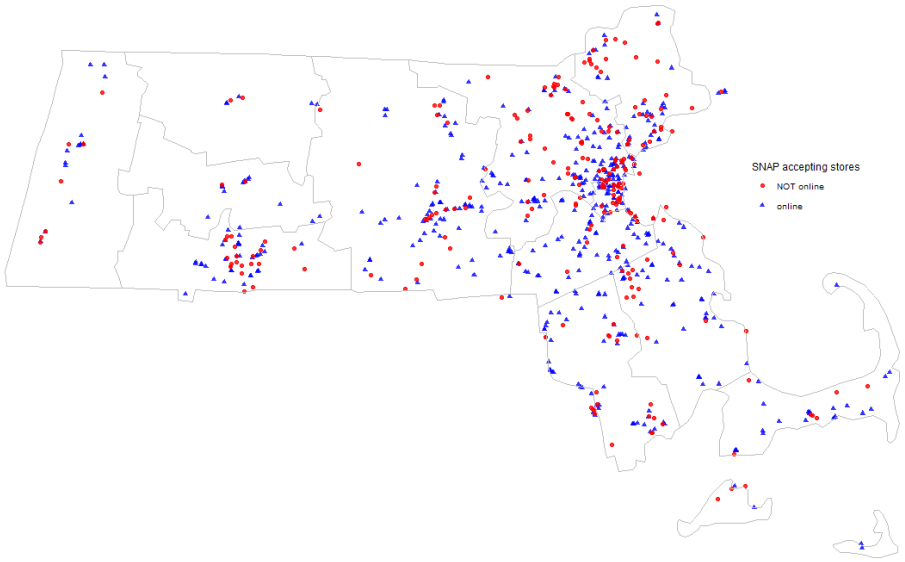


Figure A.13: Superstores' treatment status: Massachusetts

Notes: Plots supermarkets and superstores only.

B Appendix

B.1 Qualitative evidence about in-store SNAP purchases

From interviews with SNAP participants, there is some qualitative evidence that stigma may be one factor affecting SNAP participants' shopping behavior when purchasing in-store.

SNAP participants have reported the following when shopping using SNAP benefits at the grocery store, which suggest that SNAP status is still potentially socially visible when shopping in-person.

- It takes longer in line at the register to sort items and process payments (requires extra steps).
- Cashiers "announce" to the store that someone is using SNAP benefits
- The SNAP participant might know a cashier who works at the store

- Cashier treats participant with less respect
- Participant uses cash instead of obtaining tokens to use SNAP at the farmers market

SNAP participants have reported the following behaviors which are often associated with avoiding potential stigmatization.

- Using the self-checkout line
- Limiting the number of trips to the grocery store
- Going to the store when it's less crowded (e.g. evenings, weekdays)
- Going to a different store where one is less likely to run into people they know
- Going to a store where SNAP payment is less visible i.e. because there are fewer extra steps to to process payment
- Giving EBT card to someone else to complete a grocery purchase

Here are some quotes that illustrate some of the behaviors described above.

"Two older adults mention feeling self-conscious when they are at the grocery store using their EBT card. Sandy mentioned not feeling treated with dignity and respect:

'I do find it's difficult at the grocery store. I always try and use the personal check out machines.'

Madeline, who tends to shop at Whole Foods in New York City, also talks about the difficulty of using her EBT card:

'*And the other thing I've noticed is that when I'm in Whole Foods, and this does bug me, none of the people on the checkout desk know how to process or they need a special code to enter into the register when they are dealing with a SNAP card which means they are running up and down calling 'SNAP benefit.' And you're standing there and you're like you know what I'd kind of like this to be a private transaction. I don't need the Whole Foods know that I'm using a SNAP card. So, they have to go and track down somebody else to come*

and help them with the transaction. A) it takes longer and B) there is no privacy. They are screaming up and down the aisle like 'can you come help with this SNAP customer.' "

From Amaral and Gonzales (2022)

Cashiers annoucing a customer's SNAP status; EBT card looks different; EBT payment takes longer:

"I don't particularly like [the EBT card] because it's different from a credit card, you have to use a different machine and the card...it just looks different. So when you're in the line and there's customers behind you and you're dealing with the cashier, you know, like everyone, the whole world's announced that, 'Hey, this guy's on benefits.' He has to use a whole 'nother machine to process his payments. I don't think that's necessary. I think there should be a way that you can process the funds off the same machine as the credit card machine. And then change the card to look like any other credit card, like don't, you know, put a person on front street and like just broadcast to the whole grocery store that I'm on benefits, cuz it's really no one else's business."

Former SNAP participant, Interview conducted for Heath, Holcomb and Pukelis (2022)

Cashier treats participant with less respect:

"I do notice that some cashiers or whatever will kind of treat you with a different set of respect. Like they'll treat you differently because they feel like, I guess, you're just a...person on the bottom. I don't like that. I have noticed that a couple times, like, you know, if I go in there and spend my credit card and it's black, you know, 'Hey Mr. Such-and-Such, good morning,' you know, everything is professional and up the standard, and how it should be, you go in there with your EBT card, but, 'Hey, you guys accept EBT or,' 'Oh, it's right there'. You know, now they think they can just talk to you crazy. You know, just handle you, the, the attitude that's portrayed to you is different than the attitude that's portrayed when you present a credit card, you know, I have noticed that, but it, it didn't bother me. It does bother me. It does because it's not right. But not to the point where I wouldn't use

it because I'm not gonna let pride stand in the way of the greater goal...I noticed it 'cause I make purchases and if I use cash or credit card, the atmosphere is slightly different than when you go in there with the EBT card...the hospitality is not as warm, I guess. And not to say all the time or on a consistent basis, but I've seen it before."

Former SNAP participant, Interview conducted for Heath, Holcomb and Pukelis (2022)

Individual avoiding using SNAP benefits at a farmers' market:

"Cassie, a single woman on SNAP living in a wealthy community in Florida sometimes goes to the farmer's market but feels the difficulty in using her EBT card at these markets. To use an EBT card at a farmer's market, the EBT card holder must swipe their card in exchange for market tokens to use at individual booths throughout the market:

'*And also it's a stigma. I don't know if other people could buy these tokens that they have. Now I live in an affluent neighborhood and so to go to the farmer's market it's very much the bougie upscale clientele you look at who is in the farmer's market. They are in their name brand flip flops and manicured nails. Sometimes it was easier just to use cash out of pocket to do that.*' "

From Amaral and Gonzales (2022)

C Data Appendix

C.1 Data Collection of SNAP Online Rollout

The primary source of data collection for the rollout of SNAP online was by visiting USDA's SNAP online webpage[27] monthly and coding up information of rollout across retailers and states. There were a few months where I failed to collect rollout information from this site. To fill in the timing of rollout for these state-retailer pairs, I used a combination of the Wayback Machine, state websites, online articles, Facebook postings on retailers' official

[27] https://www.fns.usda.gov/snap/online-purchasing-pilot

accounts, and press releases from states or retailers. This allowed me to find an exact month of implementation for 88 percent of all state-retailer-month observations. Where I could only find a range of possible rollout months rather than an exact month, I impute using the midpoint of the range. When non-zero, the average range is 3.14 months long.

C.2 Matching Online Rollout to Store Location Data

Recall that the online rollout data is at the state-retailer-month level, and the store location data is at the (state-)retail store level. Thus, the match will occur within state-retailer. To match across the datasets, I limit candidate matches to within the same state. Then, I clean the retailer name strings in each dataset, including the following steps:

- trim spaces, make lowercase, remove punctuation
- split name at "DBA" ("Doing Business As") $\rightarrow$ two candidate matching names
- remove store numbers (store location data only)
- remove "inc", "llc"
- remove and tag common words (e.g. "food", "supermarket", "store")
- remove state name or state abbreviation
- remove city name or county name

Round 1 – Then I perform an exact match. Conditional on matching, 89 percent of store names match exactly on this first round.

Round 2 – For rollout data that doesn't match, I do some hand-checking with the aid of a fuzzy match. With this hand-checking, I make some manual changes to the retailer names, and rerun the exact match. Conditional on matching, the remaining 11 percent of store names match through this second round.

C.3 Aggregate Redemption Data

Aggregate redemption data was obtained from Retailer Management Annual Reports and Retailer Management Year End Summaries.[28] In particular, I use the table "Redemptions by Firm Type" for each year. All categories not listed specifically are collapsed into an "other" category.

C.4 Amazon Fresh availability data

Since Amazon grocery delivery through Amazon Fresh does not have physical store locations, I separately collect Amazon Fresh delivery availability. Specifically, I query Amazon Fresh's webpage for every U.S. zipcode.[29] The query also includes information on Whole Foods delivery availability. I collect this information between June 17, 2023 and July 16, 2023. Assuming the geography of Amazon Fresh availability is fixed over time, I code Amazon Fresh as available in a locality when Amazon online becomes available in that state according to the online rollout data. The Amazon Fresh availability data are collected at the zipcode-level (ZIP Code Tabulation Area, or ZCTA-level). Therefore, I use HUD files to crosswalk between zip and county, using the 2020Q1 version. I define a county as having Amazon Fresh available if *any* containing zipcode has Amazon Fresh available during that month. For the definition of online shopping availability at the county level: if Amazon Fresh delivery is available in a county, I count it as an additional store in both the numerator and denominator. If Amazon Fresh delivery is not available in a county, it is not counted in either the numerator or denominator.

Store Type	Store Code	Definition
Convenience Store	CS	Self-service stores that offer a limited line of convenience items and are typically open long hours to provide easy access for customers. Primarily engaged in retail sale of a variety of canned goods, dairy products, pre-packaged meats and other grocery items in limited amounts. Usually sell a large variety of ineligible products; such as hot coffee, alcohol, or tobacco products.
Combination Grocery / Other	CO	Primary business is sale of general merchandise but also sell a variety of food products. Such stores include independent drug stores, dollar stores, and general stores.
Direct Marketing Farmer	DF	Designation applies to direct marketing farmers; these are individual producers of agricultural products, particularly fresh fruit and vegetables, as well as meat, fish, dairy, and/or grains that are sold to the general public through a direct marketing venue such as a roadside farm stand, pick-your own operation, and/or market stall within a farmers' market. This store type differs from fruit/vegetable, meat, fish, and bread specialty firms in that the products are sold directly by the producer (farmer) rather than a retailer selling produce, meat, dairy, and/or grains purchased from a wholesale or other entity (i.e. a third party selling products purchased from or on behalf of a farmer/producer is not a direct marketing farmer).
Delivery Route	DR	A store that does not have a permanent store location, this includes delivery routes that deliver food at set locations and times, as well as rolling routes. Routes typically sell milk, bread, produce or other staple foods and are most common in rural areas.
Farmers' Market	FM	A single or multi-stall market that sells agricultural products, particularly fresh fruit and vegetables, to the general public at a single or multiple locations. This designation applies to any organization that operates a farmers' market location.
Internet Retailer	IR	A store that accepts SNAP benefits on their website. A separate FNS authorization is required in order to participate in SNAP online purchasing.
Large Grocery Store	LG	A store that carries a wide selection of all four staple food categories. They may sell ineligible items as well, but their primary stock is food items.
Medium Grocery Store	MG	A store that carries a moderate selection of all four staple food categories. They may sell ineligible items as well, but their primary stock is food items.
Military Commissary	MC	Designation applies to all retail food entities, located on military installations that sell food and non-food products. Only authorized shoppers may shop at these entities and they must show proper military ID to use the commissary or Base Exchange.

Table C.1: Definition of Store Types: Part I

Store Type	Store Code	Definition
Non-Profit Food Buying Cooperative	BC	Any store that operates as a "cooperative."
Small Grocery Store	SG	A store that carries a small selection of all four staple food categories. They may sell ineligible items as well, but their primary stock is food items.
Specialty Food Store - Bakery/Bread	BB	Food stores specializing in the sale of bread/cereal products. May also carry non-food items or other food items, but such stock is incidental to the primary specialty food stock.
Specialty Food Store - Fruits / Vegetables	FV	Food stores specializing in the sale of fruits and/or vegetables that operates in a fixed or semi-permanent location. This includes any permanent store whose primary business is the sale of fruits/vegetables, such as a produce market; as well as any produce stand that does not qualify as a Direct Marketing farmer or is not affiliated with a farmers' market. Seasonal produce stands qualify under this category. May also carry non-food items or other food items, but such stock is incidental to the primary specialty food stock.
Specialty Food Store – Meat / Poultry Products	ME	Food stores specializing in the sale of meat products. May also carry non-food items or other food items, but such stock is incidental to the primary specialty food stock.
Specialty Food Store - Seafood Products	SE	Food stores specializing in the sale of seafood products. May also carry non-food items or other food items, but such stock is incidental to the primary specialty food stock.
Supermarket	SM	Establishments commonly known as supermarkets, food stores, grocery stores and food warehouses primarily engaged in the retail sale of an extensive variety of grocery and other store merchandise. This store typically has ten or more checkout lanes with registers, bar code scanners, and conveyor belts.
Super Store/Chain Store	SS	Very large supermarkets, "big box" stores, super stores and food warehouses primarily engaged in the retail sale of a wide variety of grocery and other store merchandise. Includes stores that are large food/drug combo stores and mass merchandisers under a single roof, and membership retail/wholesale hybrids offering a limited variety of products in warehouse-type environment.

Table C.2: Definition of Store Types: Part II

Source: https://www.fns.usda.gov/snap/store-definitions; Accessed 05/13/2023.

C.5 Definition of Store Types

C.5.1 Definition of Internet Retailer

"STARS designates the "Internet Retailer" category as including all redemptions made through online retail stores, regardless of brick-and-mortar store type or method of grocery delivery (i.e., picked up by the customer at a brick-and-mortar store or delivered to a customer's home). Benefits redeemed at retail businesses with both online and brick-and-mortar store(s) are associated solely with this category if they are redeemed online or solely with the other corresponding category if they are redeemed at a brick-and-mortar store. Redemptions do not include additional delivery or pickup fees, which cannot be paid with SNAP benefits. Some retailers offer online ordering of groceries and allow payment with SNAP benefits at the time of pickup; these redemptions are not included in this category. Data for online redemptions is only available for February 2020 and later months." Source: Jones (2021)

C.6 County-level Enrollment Data

Outcome	**Num. states available**
Any outcome	30
Households enrolled	28
Individuals enrolled	28
Benefits issued	20
Adults, children enrolled	9
Applications received	8
Applications approved, denied	7
Applications expedited	5

Table C.3: Availability of County-level Enrollment Data

[28] https://www.fns.usda.gov/snap/retailer/data
[29] https://www.amazon.com/fmc/learn-more

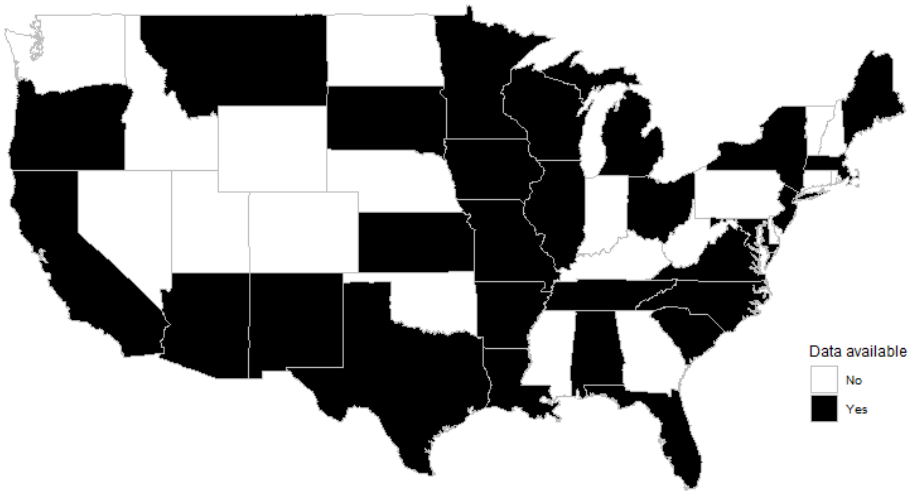


Figure C.1: States with county-level enrollment data available

Notes: State is shaded if household enrollment data is available. Data is not available from Alaska or Hawaii.

	States without hh enrollment data	**States with hh enrollment data**
Num. states	25	28
Take-up among:		
all eligibles*	86.1	81.2
elderly*	46.7	47.3
working poor*	78.2	72.9
% of:		
SNAP redemptionsˆ	23.9	76.1
SNAP storesˆ	24.1	75.9
populationˆ	23.9	76.1
% of SNAP households:		
All	23.9	76.1
with children	22.8	77.2
with elderly	23.3	76.7
with non-elderly	27.3	72.7
with childless adults	26.1	73.9
with earnings	22.8	77.2
with zero gross income	24.4	75.6
with SSI	25.6	74.4
with TANF	18.7	81.3
*population weighted; ˆusing 2019 data		

Table C.4: Selection of States with Enrollment Data

Source: State-level statistics come from https://www.fns.usda.gov/usamap. Redemptions and stores come from Retailer Management Annual Reports and Retailer Management Year End Summaries. Population statistics are from the Census.