

The Impact of Dollar Store Expansion on Local Market Structure and Food Access

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Abstract

This paper studies the expansion of dollar store chains in the U.S. since 2008, which has generated public interest in their impact on retail markets and food accessibility. We show evidence that dollar store chains compete strongly with the grocery segment and find that their expansion has led to a large decline in the number of grocery stores and a significant reduction in fresh produce consumption for households with low income and high travel costs. The impact of dollar store entry increases in the number of entries. We find no significant changes in spending in other product categories.

Keywords: retail entry, dollar store, food access, nutritional inequality

JEL Classification: L13, D43, L51

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1 Introduction

The growth of large chain retailers over the past several decades has transformed the retail sector in the United States, with implications for competition, labor markets, and aggregate outcomes such as inflation and productivity. A more recent and less studied phenomenon is the broad and dramatic rise of the dollar store retail format. Following previous waves of growth by large retail chains, the three main dollar store chains (Dollar General, Dollar Tree, and Family Dollar) have, in many ways, become the dominant mode of retailer in many markets, impacting competition, affordability, convenience, and food accessibility for a significant portion of the population.

The distinguishing features of these chains are the use of single or limited price points, particularly selling most goods for \$1, and assortments consisting of small serving-size basic consumables, clearance or irregular goods, and notably, a lack of fresh produce. Beginning in the 1950s, these chains exhibited slow but steady growth over the decades that followed, establishing themselves primarily in small towns in rural areas. Following the 2008 recession, the growth of this format has been and continues to be exceptionally rapid.¹ In 2021, there were more of these stores operating than all the Walmarts, CVS, Walgreens, and Targets combined by a large margin. During the period 2018-2021, roughly half of all retail stores that opened in the U.S. were dollar stores.

The growth of dollar store chains has raised a number of policy issues: in particular, many policymakers have expressed concerns that the rapid entry of dollar store chains in their cities has forced out local independent retailers, including neighborhood grocery stores. The latter may be especially concerning to the extent it reduces access to produce and other perishable food items for low-income residents, creating “food deserts.” These concerns and others have led many localities to ban dollar store chains from entering or pass dispersal regulations limiting their store density.²

¹The top three chains were collectively opening stores at the rate of 3.75 stores a day over the past decade (authors’ calculations).

²A partial list of cities that have banned dollar store entry or passed ordinances restrict-

Broadly speaking, the arguments for and against dollar store chains fall along these lines. Proponents argue that they introduce additional choice into underserved retail markets and that their strategy of entering in low-rent areas and opening multiple stores in the same market results in greater convenience for customers who can make short trips for specific items rather than long trips to the nearest big box store, which could be a large distance away.

Opponents maintain that the aggressive entry strategy of dollar store chains has caused the exit of local independent retailers and prevented the entry of other retailers. Even if consumers value the convenience of the dollar stores, their strategy of offering basic consumables and household products efficiently using a low fixed cost model and avoiding the costly and complex provision of perishable food results in them capturing a large share of nearby grocers' profits. This could leave grocers unprofitable on the basis of food sales alone and potentially lead to exit, reducing convenient access to fresh produce and exacerbating nutritional inequality. Yet despite the extensive public and policy debate surrounding these issues, the academic literature has yet to study these claims or the broader effects of dollar store chain expansion.

In this paper, we provide new empirical evidence on the core issues in this policy debate. Our primary research questions are the following: what has been the effect of dollar store expansion on local retail markets, and particularly on the number of independent grocery stores? Downstream of market structure, what has been the effect on consumers and their spending patterns, particularly spending on fresh or perishable food? For each of these questions, we both estimate average effects and use our granular data to analyze distributional impacts.

We leverage data from several sources. We track the number and type of retail stores, including dollar stores, across the U.S. using the Supplemental Nutrition Assistance Program (SNAP) Retailer panel, a yearly panel of SNAP-authorized retailers from 2008 to 2019. An advantage of this dataset is

ing the number of dollar stores that may enter includes: Birmingham AL, Atlanta GA, New Orleans LA, Akron OH, Oklahoma City OK, Tulsa OK, and Fort Worth TX. See <https://ilsr.org/dollar-store-restrictions/>

that it covers small independent retail stores, which are typically absent from other retail census used in the literature. We match the data on store openings and closings to the Circana (previously named IRI) Consumer Network panel, which contains household-level data on all retail purchases for a large nationwide sample of consumers.

We first use an event study design to study the effects of dollar store entries on local market structure. We control for market-level demographics and demographic trends, as well as market-year fixed effects, and consistently find that dollar store entries are associated with a significant decrease in the number of independent grocery stores.³ The effect size is roughly the loss of one grocery store for every three dollar stores when measured in the area 0-2 miles around the entry location. In the area 2 to 5 miles away, the effect size becomes substantially smaller, suggesting the effects are local. The previous literature on the market structure effects of retail chain expansion has shown that big box chains such as Walmart do not compete intensely with local “mom and pop” grocery stores due both to vertical differentiation and their spatial distribution (Ellickson and Grieco (2013)). Our results suggest that because of dollar stores’ vertical positioning and spatial pattern of entry, their entry, by contrast, has led to large negative effects on these grocery stores.

When studying how consumer shopping behavior changes with dollar store entry, we find that households shift a share of their purchases away from grocery and convenience stores to the dollar stores. Households also decrease their spending (and volumes purchased) on produce by modest but significant amounts (4% to 7.3%), an effect that is increasing in the number of dollar store entries and acts in part through grocery store exits. This average effect masks important heterogeneity across households: low-income households (annual

³We follow the definition of “grocery stores,” which are distinct from “supermarkets and supercenters” in the USDA SNAP panel. Grocery stores are store primarily focused on selling food and consumable products, carry all four staple food categories, have annual revenue below \$2m, and are generally independently owned. Supermarkets/centers have annual revenue above \$2m, carry all four staple food categories, are part of a retail chain, and typically have ten or more checkout lanes with registers, bar code scanners, and conveyor belts. This definition has been used to define supermarkets in previous studies, e.g., Ellickson and Grieco (2013).

income less than \$45,000) and households with high travel costs (proxied by vehicle access) experience large declines in fresh produce spending (around 15%) whereas high income households (annual income above \$70,000) are not affected. This finding is consistent with the notion that, in low-income areas, consumers rely more on independent stores for their food purchases, because high travel costs limit their access to large chain grocers (Ellickson and Grieco (2013)).

The estimated reduction in fresh produce spending due to dollar store entry explains between 13% and 27% of the difference in fresh produce spending between high and low income households. By contrast, we do not find evidence that dollar stores lead to significant changes in spending on other food categories (e.g., canned produce, dairy, meats).⁴

Related Literature. This paper contributes to three lines of research in economics. The first is the study of the evolution of the U.S. discount retail sector. This literature has focused on the impact of big box retailers (e.g., Walmart, K-Mart) and the supercenter format on market structure and competition (Jia (2008), Zhu and Singh (2009), Basker and Noel (2009), Igami (2011), Ellickson and Grieco (2013), Grieco (2014), Arcidiacono et al. (2020)), on labor markets (Basker (2005)), and the role of chain and density economies (Holmes (2011), Ellickson et al. (2013)). A key finding in this literature is that Walmart’s entry primarily harmed larger chain retailers in the local area within two miles of entry (Ellickson and Grieco (2013)). Small local retailers were not substantially harmed due to travel costs and horizontal and vertical differentiation between firms. Our results suggest that, whereas small local retailers were not in direct competition with big-box retailers like Walmart, the dollar store format is more of a direct competitor to these stores and has had a large impact on local retail markets as a result. The rise of the dollar store format, therefore, has a distinctive impact on retail and raises unique

⁴Our results complement earlier work on “food deserts,” such as Allcott et al. (2019), who find limited impacts from grocery store entries on produce purchases of nearby households. We find consistent results on grocery store entries, but much larger (negative) impacts from grocery exits, suggesting an asymmetry in how different changes to market structure impact consumer behavior.

policy questions.

Our findings are in line with recent and emergent work studying the dollar store format: [Feng et al. \(2023\)](#) show that, despite their limited food assortments, dollar stores represent a growing share of food purchases especially in small markets. [Chenarides et al. \(2021\)](#) find that dollar store entry in a food desert area increases the likelihood that it remains a food desert; [Lopez et al. \(2023\)](#) show that dollar store entry is associated with grocery store exit, lower retail employment and sales, with these effects being larger in rural communities. In concurrent work, [Chenarides et al. \(Forthcoming\)](#) study the impact of dollar store expansion using a dynamic model of entry and data from Texas. They find that dollar stores benefit supermarkets by displacing the competitive fringe of small independent retailers. In subsequent work, [Schneier et al. \(2023\)](#) investigates the effects of the first dollar store entry in a zipcode on prices paid and basket size. [Cao \(2022\)](#) studies the welfare implications of dollar stores’ entry via increased retail variety and supply of private-label products. Concurrent work by [Caoui et al. \(2024\)](#) estimates a dynamic game of spatial competition between dollar stores and rival retailers. They find in counterfactual simulations that dollar store entry led to a 31% to 33% reduction in the number of grocery and convenience stores and that, in response, grocery retailers spatially differentiate by entering higher income locations. Relative to these other works, this paper is the first to establish a direct link between dollar store-induced changes in market structure and changes in consumers’ shopping behavior. We show that dollar store entry impacts household consumption—especially for low-income households with higher travel costs—and that this effect is partly driven by the exit of nearby grocery stores.

Second, this paper is related to the study of consumers’ grocery shopping behavior and food accessibility. There is an extensive literature studying nutritional inequality in the U.S., with studies focusing on price-, access-, and nutrition education-based interventions ([Levi et al. \(2019\)](#)). Studies of food access have focused on introduction of grocery stores to markets designated as “food deserts,” with case studies around individual store entries having found

mixed results (Cummins et al. (2005), Cummins et al. (2014), Elbel et al. (2015), Dubowitz et al. (2015), Liese et al. (2014), Rose and Richards (2004), Ver Ploeg and Rahkovsky (2016), Weatherspoon et al. (2013)). Notably, Allcott et al. (2019) study a large number of grocery store and supermarket entries and find they have only small effects on the nutrition of nearby consumers and that nutritional inequality in the U.S. is largely explained by demand factors rather than limited food access, with differences in access and prices, explaining only about 10% of nutritional inequality. Levi et al. (2020) find that access to grocery stores impacts fruit and vegetable spending by affecting shopping frequency, but only among households with a low value of nutrition and at distances of less than 1 mile. Hristakeva and Levine (2022) leverage hurricane-induced temporary grocery store closures to detect supply-side effects and find that households affected by these closures shift the location and nutritional value of their purchases for a substantial period of time even after the grocery store has reopened. Byrne et al. (2022) study the effect of SNAP participation by retailers on consumers’ shopping behavior and participating stores’ inventory and revenue. They find that new SNAP retailers have a limited inventory of foods (e.g., no fresh produce) and do not significantly impact SNAP-eligible households’ nutritional choices or prices paid in the 6 months following adoption.

We contribute to this literature by studying large numbers of dollar store and grocery store entry events, as well as large numbers of grocery store exits, to measure the impact of these events on households’ shopping behavior, including spending on produce. We find results consistent with previous research (e.g., Allcott et al. (2019)) that entry of a grocery store or supermarket has a limited impact on shopping behavior and nutritional choices, but we depart from this literature in that we find that the exit of existing grocery stores and the entry of large numbers of dollar stores do have significant impacts on food purchases. If consumers’ shopping behavior is characterized by inertia or habit persistence, as suggested by the store choice literature in marketing (Ho et al. (1998)), this could generate asymmetric effects between grocery store openings and closings. Our results are therefore consistent with other work (e.g.

Dubois et al. (2014)) finding that the supply side has a meaningful impact on nutritional outcomes.

The rest of the paper proceeds as follows: Section 2 describes the data and institutional details and provides descriptive statistics. Section 3 presents reduced-form static and dynamic event study results for the impact of dollar store entry on local market structure and consumers' shopping behavior. Section 4 concludes.

2 Industry Background, Data, and Descriptive Statistics

In this section, we describe the history and nature of the dollar store chains, present our data sources, and provide some descriptive statistics on the industry.

Dollar General originated the dollar store concept in 1955, selling a wide selection of low-cost basic goods at a single \$1 price point. The format became popular and a number of competing variety retailers adopted it, including Family Dollar, founded in 1959. Through decades of steady growth and consolidation among competing chains, by the 2000s there remained three major dollar store chains: Dollar General, Family Dollar, and Dollar Tree. These chains distinguish themselves from other retailers by offering low prices in the form of a single price point or a limited number of round number price points.

Unlike other discount retailers like Aldi, they do not achieve their discounts by offering small selections and a large share of private labels. Instead, they offer moderately sized selections and a mix of major brand products and private labels.⁵ The stores are built in the 8,000-12,000 sq ft range and carry 10,000-12,000 SKUs. They also save costs by employing few employees and not offering fresh produce. They primarily sell basic consumables in small formats, seasonal products, and irregular or outdated products off-loaded by

⁵For instance, private labels represented 12% of Dollar General's merchandise mix (Shih et al. (2019)).

major brands. Another distinguishing feature is their market entry strategy, with a focus on small and low income markets under-served by big box retailers. We discuss these markets in greater detail below.

The dollar store chains have grown rapidly over the past several decades, particularly so after the recession of 2008. By 2021, Family Dollar operated roughly 7,100 stores, Dollar General operated 18,000 stores, and Dollar Tree owned 4,350 stores. The combined nearly 30,000 stores are substantially more than the number of Wal-Marts (5,300 stores), Targets (1,900 stores), CVS (9,900 stores), and Walgreens (9,300 stores) combined and is significantly larger than the number of Subway restaurants (21,000 restaurants), the largest U.S. restaurant chain and is similar to the number of Starbucks locations worldwide. The three chains earned a combined \$47 billion in revenue in 2019. In 2015, the two smaller chains, Dollar Tree and Family Dollar, merged citing several potential complementarities between the two businesses: e.g., targeting broader ranges of customers, optimizing their combined real estate portfolio, exploiting synergies in sourcing, procurement, and distribution networks.⁶

Data: We combine several data sources to study dollar store expansion and the effects on consumers and local market structure.

The first is the SNAP Retailer panel, a yearly panel of SNAP-authorized retailers from 2008 to 2019. This dataset contains information on over 400,000 U.S. retailers including their chain affiliation and store type, as well as small independent retailers. The SNAP retailer panel contains any store that accepts SNAP benefits. In addition to dollar stores, this includes convenience stores, combination stores (stores selling a combination of general merchandise and food products), grocery stores, drugstores, gas stations, supermarkets, and supercenters. We use the store type variable provided in the SNAP Retailer panel (rather than the store name) to classify stores by type (e.g., dollar, grocery, convenience store). Table 1 shows store counts by type in the SNAP panel. As far as we know, the SNAP retailer data is novel in the economics

⁶“*Dollar Tree completes acquisition of Family Dollar.*” Dollar Tree, Press Release, July 6, 2015.

literature.⁷ The primary benefits of this public data source are that it is an annual measure and contains nearly the full universe of retailers in this industry. Crucially for this study, the panel includes small independent stores, which are typically absent from other retail census data used in the literature.

A drawback of this dataset is that entry into the SNAP program may not necessarily indicate the start of operation of a physical store. In particular, as the SNAP program debuted in 2008, there may have been delays in stores joining the program for the first few years. We alleviate this concern in two ways. For chains, we can compare store counts in the SNAP panel against publicly disclosed store counts in chains’ annual reports to investors. We do not find any significant discrepancies between the two sources. For independent stores, this approach is not possible: instead, we drop the first few years in the sample and restrict our analysis to the period from 2010 to 2019.

Table 1: Number of SNAP retailers by type (all U.S.)

Store type	Number of stores
Grocer	65,240
Supermarket/center	51,695
Small retail	283,140
<i>Combination Grocery/Other</i>	78,174
<i>Convenience Store</i>	204,966

Note: Combination grocery/Other includes dollar stores and drug stores. Convenience stores include gas stations.

We also compile data from the Circana Consumer Network panel, which we complement with the Circana MedProfiler dataset.⁸ The Consumer Network data contains household-level panels on all retail purchases for a nationwide sample of consumers. The MedProfiler data contain nutritional information for

⁷The dataset has been used in the geography literature studying retail proximity (e.g., [Shannon et al. \(2018\)](#)).

⁸The Circana Consumer Network household panel data come from the National Consumer Panel (NCP), a joint venture between Circana and Nielsen to collect consumer data to provide consumer and marketing insights. For more background about the history and applications of scanner data in economics research, see [Dubois et al. \(2022\)](#).

food purchases (e.g., sugar, sodium) and consumer health metrics (e.g., BMI). We observe the census tract a household resides in, which is more precise than other scanner datasets (e.g. Nielsen Homescan provides the household’s zip-code). This allows us to conduct our analysis at a more granular geographic level and construct more precise measures of retail proximity. Although the household scanner data is standard in the IO literature, we include informative summary statistics of spending by retail channel and food category in [Table A1](#) of the Appendix.⁹ These statistics show that spending at dollar stores is relatively low compared to other retail channels (e.g., supermarkets, supercenters). The largest expenditure share at dollar stores is for soda, snacks, candy, and crackers; whereas fresh produce spending is close to zero.¹⁰

Finally, we collect market-level data on demographic characteristics from the Census and ACS at the census tract level. This allows us to study how market characteristics and consumer demographics affect dollar stores and other retailers’ entry behavior and profits.

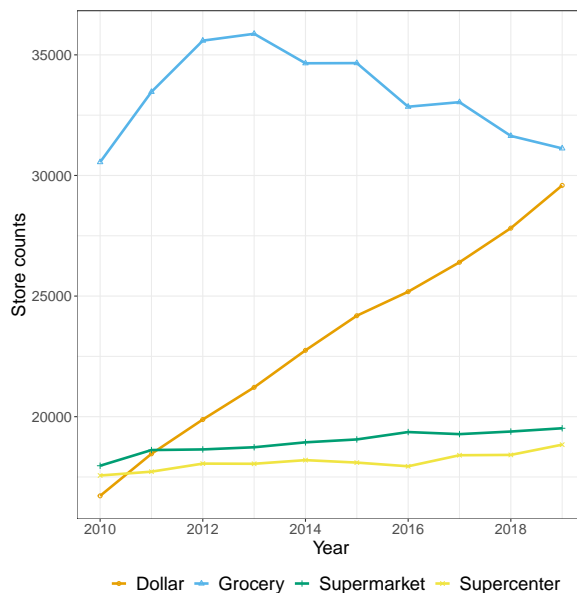
2.1 Summary statistics on dollar store entry

[Figure 1](#) shows the total number of stores at the national level over the period 2010-2019. The total number of stores operated by the three major dollar store chains increases by 12,870 during this period. This increase is the net effect of 14,554 store entry events and 1,684 store exit events. The number of grocery stores falls by 13% from its high in 2012. The number of supermarkets and supercenters is relatively stable over the sample period.

⁹We note that the “Grocery” retail channel in the Circana data includes both grocery stores and supermarkets. In this paper, when studying the impact on market structure, we distinguish between independent grocery stores and supermarket chains.

¹⁰Studies have compared household scanner data with data from other sources (e.g., Consumer Expenditure Survey, FoodAPS, and supermarket chains’ own databases) to assess differences in reporting, see for instance [Einav et al. \(2010\)](#) for Nielsen Homescan and [Sweitzer et al. \(2017\)](#) for Circana Consumer Network. These studies find discrepancies in reported prices and consistently lower expenditures in the household scanner datasets, especially for unpackaged and random weight products. Therefore, our measures of annual spending likely underestimate the true value. To alleviate this problem, we perform robustness checks in our reduced form analysis by imposing a minimum number of weeks a household reports spending.

Figure 1: Store counts by firm type



We use demographic information from the Census and the Circana Consumer Network to document consumer heterogeneity across locations with varying dollar store densities. Table 2 shows summary statistics of census demographic information for the locations entered by dollar store chains prior to 2010, during the 2010-2019 period, and locations never entered. A location is defined at the Census Tract level. Dollar store entry occurs in locations that have significantly lower incomes per capita and rents than other locations, and a significantly higher share of the population that is black or below the poverty line.¹¹

Finally, we characterize the household types that display a revealed preference for the dollar store format. First, we compare the demographics of households with a large spending share at the dollar store channel (top 95th percentile and above) post-dollar store entry to households with no spending

¹¹The patterns that emerge using the Census or ACS data are consistent with household demographics in the Circana Consumer Network panel. Table A2 in Appendix A shows that households experiencing many dollar stores entries have lower (household) income, are more likely to have a female household head, without children, and are less likely to be white, married, employed, with access to a vehicle.

Table 2: Market Summary Statistics

	(1) Pre-2010 Entry Only	(2) 2010-2019 Entry	(3) Never Entered
N	9778	12872	50378
Mean Population	4689.9 (2193.5)	4962.8 (2566.1)	4263.9 (2295.8)
Mean Income	22686.3 (7520.7)	23538.8 (8178.7)	31315.2 (16696.5)
Mean Residential Rents	753.9 (252.6)	785.9 (275.4)	1064.8 (455.8)
Mean Share White	.738 (.24)	.739 (.253)	.713 (.254)
Mean Share Black	.166 (.225)	.162 (.234)	.127 (.210)
Mean Share in Poverty	.176 (.108)	.165 (.106)	.136 (.118)
Share HH w/ Vehicle Access	.911 (.084)	.917 (.091)	.904 (.135)

Notes: Unit of observation is the Census Tract. Means are computed using 2019 data. Standard deviation across tracts appears in parentheses below each row.

at the dollar store channel post-entry. This comparison is only among households in locations with dollar store entries and is shown in Table 3. Comparing columns 1 and 2 shows that these two groups differ on several dimensions: households with high dollar store spending shares are significantly more likely to be low income, with a female household head, from a minority group, unmarried, unemployed, and without access to a vehicle. The latter group also spends less on fresh produce and at the grocery retail channel.

Second, to isolate preferences that are not merely due to dollar store proximity, we identify households with high dollar store spending who have no dollar stores within 2 miles. All else equal, these households are willing to travel longer distances to shop at this store format and may, therefore, benefit from entry as it reduces their travel costs. To implement this comparison, we select the sample of households with no dollar stores within 2 miles and regress their dollar store spending per year on household demographics (age, income, education, race, household size, marital status, occupation, and weekly hours worked), their retail environment (number of stores by format within 2 miles and from 2 to 5 miles of the household), and the survey year. Controlling for the retail environment is important because low-income households with no dollar stores within 2 miles may also lack access to other retailers (grocery and

Table 3: Demographics of Circana panelists experiencing at least one dollar store entry over the sample period

Variable	By DS Spending Share Post-DS Entry		
	No Spending	High Spending (Top 5%)	Δ (t-stat)
Income (000s)	75.08 (45.68)	41.02 (32.38)	96.6
Low-Income (<35k)	0.21 (0.41)	0.55 (0.50)	-69.6
High-Income (>100k)	0.22 (0.42)	0.04 (0.20)	71.7
Years education	15.13 (2.18)	13.91 (2.08)	57.5
No female head	0.17 (0.38)	0.14 (0.34)	9.6
No male head	0.24 (0.42)	0.42 (0.49)	-36.9
With children	0.17 (0.37)	0.12 (0.33)	13.8
Age	57.00 (13.10)	59.47 (11.41)	-20.8
Household Size	2.21 (1.22)	2.00 (1.17)	17.8
White	0.83 (0.37)	0.65 (0.48)	38.1
Black	0.08 (0.26)	0.26 (0.44)	-44.1
Married	0.60 (0.49)	0.45 (0.50)	30.3
Employed	0.57 (0.50)	0.41 (0.49)	32.3
No vehicle	0.04 (0.20)	0.10 (0.30)	-8.5
Pre-Entry Fresh Produce Spending	142.10 (140.42)	66.64 (69.54)	88.2
Pre-Entry GS Channel Spending	1929.54 (1434.27)	1186.75 (965.85)	69.6
Pre-Entry DS Channel Spending	2.20 (24.76)	223.87 (267.30)	-88.7
Observations	63,535	11,452	

Note: The unit of observation is the household-year, for the subsample of households who experience at least one dollar store entry within 2 miles over the sample period. The table shows mean values and standard errors are in parenthesis. Columns (High Spending) shows households with a share of spending at the dollar channel in the 95th percentile or above (9% of total spending). For households with two household heads, we use the mean of age, employment hours, educational attainment for male and female household heads. Household Income is available in 12 bins. Mean income is computed by taking the mid-range of each bin. The top bin (>\$100k) is coded as \$150,000.

supermarkets).

We find that the main dimensions of heterogeneity are race and household income. Figure 2 shows the estimated coefficients for income and race. Low income households and black households have significantly higher spending at dollar stores, even when such stores are located far from the household.

3 Impact of Dollar Store Entry on Market Structure and Consumer Purchases

3.1 Effects on Market Structure

In this section, we present evidence on the impact of dollar store chain entry on local retail markets. Our goal is to evaluate whether or not dollar store

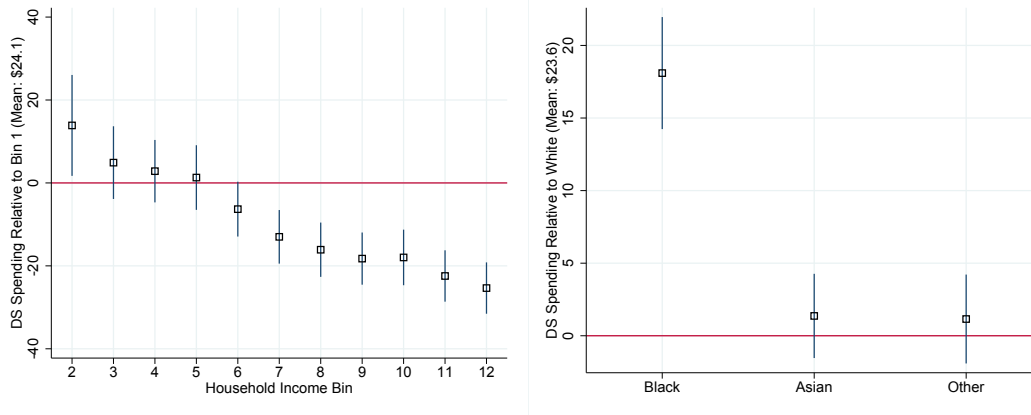


Figure 2: These figures show the estimated coefficients on income and race in the regression of dollar store spending on household demographics and their retail environment. Results are for the subsample of households with no dollar stores within 2 miles. Year fixed effects are included. For household income, the first bin corresponds to income less than \$10,000, bin 7 corresponds to income in the range \$35,000 to \$45,000, bin 10 to income in the range \$60,000 to \$70,000, the highest bin corresponds to income greater than \$100,000 per year. Standard errors are clustered at the household level.

chain entry leads to decreases in the number of local grocery retailers. We use our data containing the annual universe of retailers and study the period of rapid expansion of dollar store chains between 2010 and 2019.

During this time period, we observe 14,554 dollar store chain entries. To study the local effects of these entries, we break markets into locations defined as Census tracts. For each location, we obtain its population-weighted centroid and define distance bands around each location using radii of 0-2mi, 2-5mi, and 5-10mi. Our main outcome of interest is the number of independent grocery stores.

Our identification strategy for measuring the effects of dollar store chain entry on these outcomes is to use tract-level fixed effects to account for time-invariant unobserved market characteristics and county-year fixed effects to account for time-varying trends at the market level (see [Ellickson and Grieco \(2013\)](#) for a similar approach). We also incorporate time-varying demographic variables at the census tract level. These are intended to control for local

trends in population or income associated with economic shocks. We include population, median income, and level of residential rents as well as the annual growth rate in each of these variables. We also include a time-varying measure of overall business activity by constructing the total number of active businesses (excluding grocery and dollar stores) at the tract-year level, which we label “business density.”

We estimate effects using the following specification:

$$Y_{lbt} = \delta DS_{lt} + \beta \mathbf{X}_{lbt} + \lambda_l + \alpha_{mt} + \epsilon_{lbt} \quad (1)$$

where λ_l and α_{mt} represent location and county-time fixed effects, and the objects of interest δ are the coefficients on the number of dollar store chain entry events in location l in period t . The outcome variable Y_{lbt} is the number of independent grocery stores at distance band b around the entry location l in period t . We also define \mathbf{X}_{lbt} , the local demographics (including growth rates), at this level. To capture potential non-linear effects of changes in market structure, we include DS_{lt} as a categorical variable.

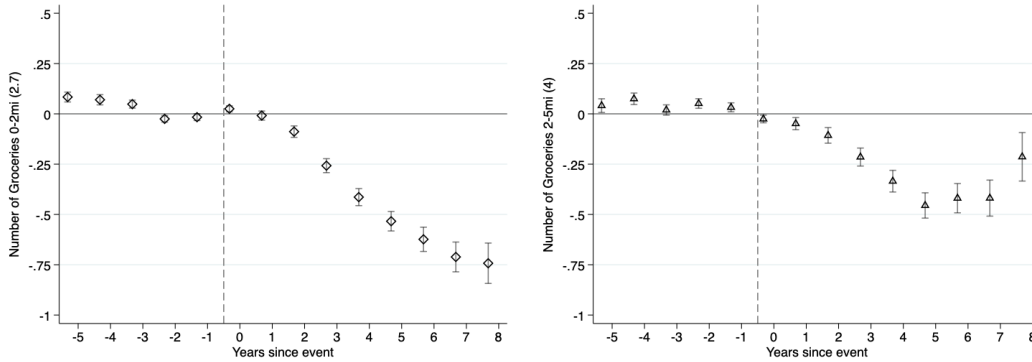


Figure 3: The effects of dollar store entry on grocery stores measured in the 0-2 mile radius around entry (left panel) and in the 2-5 mile radius around entry (right panel). Results are from an event study analysis using a heterogeneity-robust estimator proposed by [Callaway and Sant’Anna \(2021\)](#). Confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.

Before estimating Equation (1), we show graphical results via an event

study analysis over the years before and after the dollar store chain entry occurs. In this specification, we estimate:

$$Y_{lbt} = \sum_{\tau} \delta_{\tau} E_{l,t-\tau} + \beta \mathbf{X}_{lbt} + \lambda_l + \alpha_{mt} + \epsilon_{lbt} \quad (2)$$

where E_{lt} denote a dummy for whether a dollar store entry has occurred in location l by period t . This differs from the specification in Equation (1) in that the coefficients on dollar store entry are subscripted by τ , the difference in years measured relative to the entry date. This allows for both dynamic policy effects, such as a delay in the effect on local markets as the dollar store’s sales ramp up, and for detecting the presence of pre-trends in grocery store activity prior to dollar store entry. For this analysis, we also focus only on a binary dummy for whether or not an entry occurs, rather than the number of entries. The omitted category is $\tau = -1$ so that all cumulative effects are relative to the period before entry.

This design is essentially a Difference-in-Difference with a staggered roll-out of treatment. This type of empirical design has been shown to have the potential for biased results (Goodman-Bacon (2021), Sun and Abraham (2021)). Consequently, we present results based on heterogeneity-robust estimators, e.g., Callaway and Sant’Anna (2021).¹² We plot the results in Figure 3 in the manner suggested by Freyaldenhoven et al. (2021), with confidence intervals adjusted for multiple hypothesis testing. The left panel shows the effects of dollar store entry on the number of grocery stores in the 0-2mi radius and the right panel shows effects in the 2-5mi radius. In both panels, we detect no pre-trend in the number of grocery stores, followed by a clear downward trend after the time of dollar store entry. Several years after the initial dollar store entry, the effect on the number of grocery stores grows quite large.

In Table 4, we show estimates of Equation (1) for different specifications of controls and fixed effects where the outcome variable is the number of

¹²In Figure A1 of Appendix A, we present results from the TWFE implementation (corresponding to Equation (2)) as well as several other heterogeneity-robust estimators based on imputation (Borusyak et al. (2021)) and manual aggregation (Sun and Abraham (2021)) that have been suggested in the literature and they provide consistent results.

independent grocery stores within a 0-2 mile radius of the centroid of location l . We find that there is a consistent negative effect on the number of grocery stores that is increasing in the number of dollar store entries. This effect is small for a single dollar store entry, but increases to -.32 for two entries, and then to a decrease of more than 1 grocery stores in locations with 3+ entries.

Table 4: Effects of DS Entry (0-2mi) on Number of Grocery Stores

	(1)	(2)	(3)
	All Markets	All Markets	All Markets
First DS Entry	-0.109*** (0.0147)	-0.0717*** (0.0137)	-0.0705*** (0.0160)
Two DS Entries	-0.557*** (0.0300)	-0.323*** (0.0267)	-0.307*** (0.0289)
Three+ DS Entries	-1.716*** (0.0636)	-1.036*** (0.0512)	-0.976*** (0.0521)
Year FE	Yes		
Demographic Controls	Yes	Yes	Yes
Business Density			Yes
Census Tract FE	Yes	Yes	Yes
Market*Year FE		Yes	Yes
Observations	559,846	557,635	453,657
F-stat	128.1	87.3	89.6
Adjusted R^2	0.98	0.98	0.98
Mean Pre-Entry	2.71	2.71	2.71

Notes: Unit of observation is the location-year. Standard errors (in parenthesis) clustered at the location level. Controls for time-varying local demographics (income, population, residential rents, and the one-year percent change in each) and business density are included.

Table 5 shows how these effects vary by the distance from the entry location. We study regions defined by radii of 0-2mi, 2-5mi, and 5-10mi from the entry location.¹³ The results show a substantial fall in the number of grocery stores in the 2-mile radius around where the dollar store entry occurs. In the area 2-5 miles from the dollar store entry there is a smaller but still significant

¹³Each demographic variable is calculated for the region where effects are being measured.

effect when there are more than one entrants, and in the area 5-10 miles away there are no detectable negative effects of dollar store entry.

Three conclusions follow from these results. First, the negative effect of dollar store entry on grocery stores that we find is not spuriously driven by larger market-level or regional economic shocks. Second, shopping patterns for dollar stores and independent grocery stores seem to take place primarily over fairly small distances. And third, in the local area in which a dollar store entry takes place the effects on grocery stores is increasing in the number of dollar stores that enter.

We also repeat this analysis for other store types and show the results in Table A3. We find a substantially smaller but still significant negative effect of dollar store entry on the number of convenience stores and supermarkets in the 0-2mi radius, but no effect on supercenters and a small positive effect on other dollar stores, possibly suggesting economies of scale in entry.

The effects estimated in the previous analysis could include indirect effects or spillovers from treated to control locations. For instance, grocery stores may relocate from dollar store entry locations to nearby locations, or alternatively, dollar store entries may be correlated across multiple locations in a given market. To address concerns of spillovers to control locations, we drop all locations that experience dollar store entries in 2-5mi and 5-10mi radii at any point in the sample period. We re-estimate the specification in Table 4 on this subsample. By definition, the control locations in this robustness check do not experience any dollar store entry within 10mi over the sample period, whereas the treatment locations experience some dollar store entry only in the 0-2mi radius. The results are shown in Table A4. Despite the much smaller sample size, we find a statistically significant negative effect of dollar store entry on the number of grocery stores, that remains qualitatively similar to our baseline results.

Table 5: Effect of DS Entry (by distance band) on Number of Grocery Stores

	(1)	(2)	(3)
	0-2m	2-5m	5-10m
First DS Entry	-0.0705*** (0.0160)	-0.108*** (0.0184)	0.0293 (0.0180)
Two DS Entries	-0.307*** (0.0289)	-0.224*** (0.0332)	0.0578 (0.0347)
Three+ DS Entries	-0.976*** (0.0521)	-0.509*** (0.0581)	0.286*** (0.0614)
Demographic Controls	Yes	Yes	Yes
Business Density	Yes	Yes	Yes
Census Tract FE	Yes	Yes	Yes
Market*Year FE	Yes	Yes	Yes
Observations	453,657	307,321	263,488
F-stat	89.6	29.9	14.2
Adjusted R^2	0.98	0.99	0.99
Mean Pre-Entry	2.72	3.97	6.28

Notes: Unit of observation is the location-year. Standard errors (in parenthesis) clustered at the location level. Time and location fixed effects are included. Controls for time-varying local demographics (income, population, residential rents, and the one-year percent change in each) and business density are included, each is calculated for the radius area corresponding to the dependent variable.

3.2 Effects on Consumers' Shopping Behavior

This section studies how dollar store entry and grocery store exit affects households' shopping behavior. We exploit variation in local supply within household in an event study framework, as in [Allcott et al. \(2019\)](#). We begin by analyzing how the changes in market structure highlighted in the previous section affect aggregate food spending. Next, we show that the adverse impact of dollar store entry on the number of grocery stores is reflected in spending and trip diversion from the grocery to the dollar store retail channel. Finally, we examine how the above market structure changes translate into spending on various food categories and the nutritional value of households' shopping

baskets. We aim attention at spending and volume of purchases of fresh produce, specifically, because access to this particular food group has been at the center of the dollar store policy debate.

In this section, the unit of analysis is the household–year. We again consider both static and dynamic (event study design) specifications. Let DS_{bct} denote the number of dollar store entries that have occurred within distance band b (e.g., 0-2mi, 2-5mi) from census tract c by period t . Let \mathbf{X}_{it} denote time-varying household characteristics (e.g., age, education, employment, marital status). Let Y_{ict} denote the outcome variable for household i living in census tract c in period t . We consider the following static specification

$$Y_{ict} = \delta DS_{bct} + \beta \mathbf{X}_{it} + \gamma_i + \eta_t + \epsilon_{ict} \quad (3)$$

where γ_i and η_t are household and time fixed effects.

As the effects we estimate are likely persistent and heterogeneous over time, we also consider a dynamic specification in an event study framework. Let E_{bct} denote a dummy for whether a dollar store entry has occurred within distance band b (e.g., 0-2mi, 2-5mi) from census tract c by period t . We consider the following dynamic specification

$$Y_{ict} = \sum_{\tau} \delta_{\tau} E_{bc,t-\tau} + \beta \mathbf{X}_{it} + \gamma_i + \eta_t + \epsilon_{ict} \quad (4)$$

Spending and number of trips by retail channel.

Table 6 shows the effect of dollar store entry (within 2 miles of the household) on spending and the number of yearly trips by retail channel.¹⁴ The results indicate that dollar stores divert spending away primarily from the grocery and convenience retail channels, but not from supercenters or club stores. Entry is associated with an increased number of trips to the dollar channel, from 4.8 to

¹⁴Retail channels, as defined by Circana, correspond to broad retail categories. The “Grocery” channel includes both supermarkets and grocery stores but excludes supercenters and club stores. Other smaller retail categories (in terms of spending share), not shown in Table 6, include farmers’ markets, military commissaries, and bulk food stores which also see sales diversion to dollar stores.

Table 6: Effect of DS Entry (0-2mi) on Spending and Number of Trips by Retail Channel

	Spending by Channel					Trips by Channel			
	(1) Aggregate	(2) Grocery	(3) Dollar	(4) SC/Club	(5) Conv	(6) Grocery	(7) Dollar	(8) SC/Club	(9) Conv
First DS Entry	-30.82*** (6.590)	-20.85*** (5.048)	5.063*** (0.493)	-5.612 (3.845)	-0.991* (0.413)	-0.913*** (0.169)	0.670*** (0.0509)	-0.141 (0.102)	-0.162*** (0.0478)
Two DS Entries	-6.746 (12.28)	-8.324 (9.946)	5.949*** (0.952)	-1.104 (7.219)	0.108 (0.702)	-0.888** (0.339)	1.060*** (0.100)	0.416* (0.201)	-0.158 (0.0989)
Three+ DS Entries	40.52 (21.03)	30.05 (16.79)	10.48*** (1.644)	-7.074 (11.19)	-2.105 (1.409)	-0.450 (0.625)	1.572*** (0.187)	1.269*** (0.338)	-0.539** (0.184)
Observations	570,689	570,689	570,689	570,689	570,689	570,689	570,689	570,689	570,689
F-stat	838.8	426.7	4.14	928.2	2.24	48.0	6.84	674.5	2.79
R^2	0.83	0.84	0.77	0.84	0.68	0.84	0.81	0.84	0.75
Adjusted R^2	0.79	0.80	0.71	0.80	0.61	0.81	0.76	0.80	0.70
Mean Pre-Entry	2917.3	1768.3	32.3	777.2	14.6	57.8	4.85	22.4	2.16

Notes: Unit of observation is the household-year. Standard errors (in parenthesis) clustered at the household level. Year and household fixed effects are included. Controls for time-varying household demographics (income, education, age, household size, marital status, occupation, weekly hours worked) are included. Results are shown for all panelists in the sample. The first column shows aggregate spending. SC/Club stands for the Supercenter and Club store channel. Conv stands for the convenience store channel.

5.5 trips following one entry and 5.8 following two entries. The impact of entry on the number of grocery and convenience trips is negative and significant.

Spending on fresh produce and dollar store entry.

Next, we turn to the effect on fresh produce spending, a key outcome of interest for policymakers. Table 7 shows the effect of dollar store entry within 2mi and from 2 to 5mi of the household on fresh produce spending. Overall, we find a negative and significant effect of entry within 2mi of the household on produce spending across samples (all households, those part of a balanced panel, and those part of a balanced panel and reporting random weight products). The magnitude of the effect increases with the number of dollar store entries but is overall modest in size.

We investigate the heterogeneity in this effect by household characteristics. Figure 4 shows the coefficients on dollar store entry for the balanced panel (column (2) of Table 7) interacted with household income (in 12 bins, top panel) and vehicle access (bottom panel). The results indicate that the negative effect of dollar store entry on fresh produce spending is mainly driven by lower-income households (income up to \$45,000 or bins 1 to 7). For this

Table 7: Effect of DS Entry (by distance band) on Fresh Produce Spending

	0-2mi			2-5mi		
	(1) All	(2) Bal	(3) Bal/RW	(4) All	(5) Bal	(6) Bal/RW
First DS Entry	-0.945 (0.588)	-1.609 (0.951)	-3.216* (1.267)	0.0319 (0.504)	0.478 (0.872)	0.520 (1.199)
Two DS Entries	-3.431** (1.148)	-5.366*** (1.621)	-7.262*** (2.143)	0.315 (0.782)	-0.492 (1.197)	-0.0342 (1.669)
Three+ DS Entries	-5.209** (1.934)	-8.323*** (2.410)	-7.465* (3.236)	-1.292 (1.098)	-2.692 (1.545)	-0.677 (2.151)
Observations	570,689	246,851	154,988	570,689	246,851	154,988
F-stat	55.3	6.36	4.35	55.2	6.25	4.17
R^2	0.76	0.74	0.78	0.76	0.74	0.78
Adjusted R^2	0.71	0.72	0.74	0.71	0.72	0.74
Spending Pre-Entry	130.9	146.4	155.4	126.1	137.9	144.6

Notes: Unit of observation is the household-year. Standard errors (in parenthesis) clustered at the household level. Year and household fixed effects are included. Controls for time-varying household demographics (income, education, age, household size, marital status, occupation, weekly hours worked) are included. The balanced panel (“Bal”) corresponds to households observed for at least 9 consecutive years. The “RW” panel reports complete purchases of random weight products.

group, a single dollar store entry reduces spending by 2.3% to 13.8%, two entries reduce spending by 5.1% to 25.8%, and three or more entries reduce spending by 7.24% to 30.44% depending on the household income bin. Moreover, households without vehicle access (a proxy for travel costs) experience a significantly larger decline in their fresh produce spending following one and two entries, although this group is small.

To put these effects into a broader perspective, we compute the difference in fresh produce spending between low and high-income households, controlling for household size, age, and year indicators. We compare households with annual income below \$45,000 to households with annual income greater than \$70,000. We find that the reduction in fresh produce spending due to dollar store entry explains between 13.2% and 27% of the difference in fresh produce spending across high and low income households.

Table 7 shows that these effects are localized spatially. Entry of dollar stores in the 2-5mi distance band (columns (4) to (6)) does not significantly

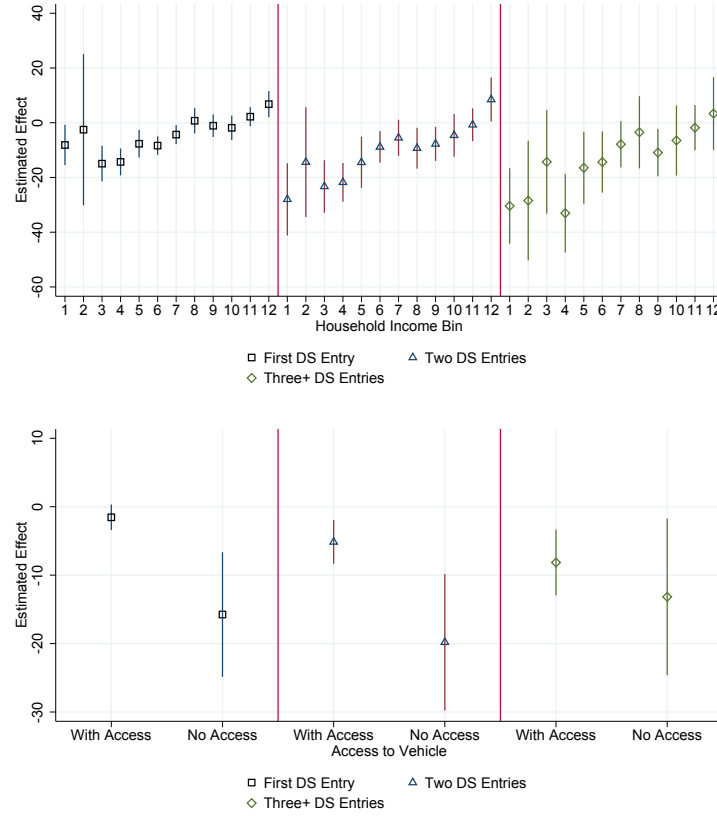


Figure 4: The effect of dollar store entry at the 0-2mi band around the household on fresh produce spending, by household income bin (top panel) and access to vehicle (bottom panel). Results are shown for the balanced panel. For household income, the first bin corresponds to income less than \$10,000, bin 7 corresponds to income in the range \$35,000 to \$45,000, bin 10 to income in the range \$60,000 to \$70,000, the highest bin corresponds to income greater than \$100,000 per year. Standard errors are clustered at the household level.

affect produce spending. Figure 5 shows the corresponding event study plots for the balanced sample, using a two-way fixed effect as well as a heterogeneity-robust estimator (Callaway and Sant’Anna (2021)).¹⁵ Consistent with the static analysis, we find that the effects are localized and negative only at the 0-2mi range. Moreover, the negative impact on fresh produce spending is dynamic, with the magnitude increasing in the time since entry.

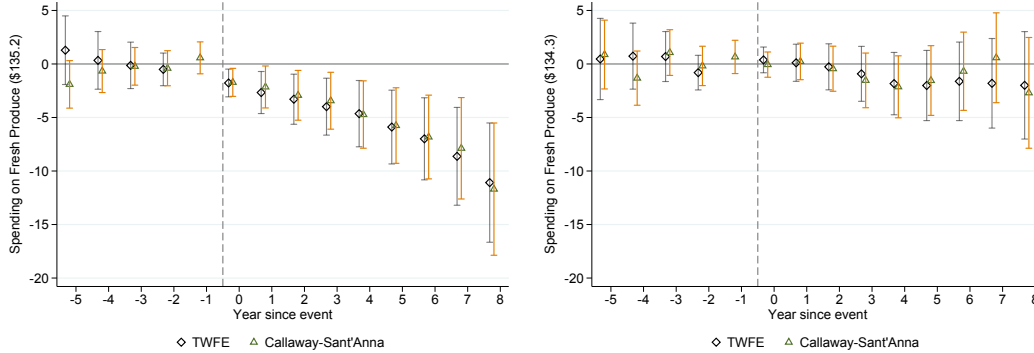


Figure 5: The effects of dollar store entry at the 0-2mi (left panel) and 2-5mi (right panel) bands around the household on spending on fresh produce. Results are from an event study analysis on the balanced panel, using a TWFE and a heterogeneity-robust estimator proposed by Callaway and Sant’Anna (2021). Household and year fixed effects are included. Confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.

As a robustness check, we also perform the event study analysis on subsamples of households controlling for the number of weeks a household reports spending (see footnote 10 for a discussion of known under-reporting issues in the Nielsen and Circana household scanner data). The results, shown in Figure A3 in Appendix A, are quantitatively similar.

Spending on fresh produce and grocery store exit.

The reduction in fresh produce spending documented above may be due to a direct effect (e.g., substitution away from produce due to preferences for the

¹⁵We experiment with several other heterogeneity-robust estimators based on imputation (Borusyak et al. (2021)) and manual aggregation (Sun and Abraham (2021)). Results are shown in Figure A2 of Appendix A.

dollar store format and products) and an indirect effect (e.g., reduced access to produce from changes in market structure). We provide evidence that the impact of dollar store entry on fresh produce spending acts in part through exits of grocery stores and reduced access. [Table 8](#) shows the effect of dollar store entry on fresh produce spending, controlling for the number of grocery store exits (all in the 0-2mi radius). Given the effect heterogeneity uncovered in [Figure 4](#), we interact these market structure changes with household income (below or above bin 7).

Comparing column (1), which includes dollar store entries only, to column (2) indicates that, for low-income households, grocery store exits explain a significant proportion (43%) of the effect of dollar store entry on fresh produce spending. For instance, the aggregate effect of three dollar store entries on low-income households' spending (-\$15.86 in column (1)) can be decomposed into a direct effect (-\$8.17 in column (2)) and an indirect effect from one grocery store exit (-\$6.82 in column (2)).¹⁶

Spending on other food categories.

One argument in favor of dollar store entry is its potential for lowering prices and increasing cost savings for consumers. We therefore test whether dollar store entry reduces total expenditure on other food categories. [Table 9](#) show spending on food categories ranging from Soda and Snacks to Meals (soup, rice, and pasta). The majority of changes in spending are insignificant, except for frozen produce, on which spending increases following three or more entries. We note, however, that the latter effect is not robust when broken down by income.¹⁷

Quantities of fresh produce purchased.

¹⁶Section 3.1 shows that three dollar stores entries displace on average one grocery store. We also run alternative specifications for [Table 8](#) (e.g., including only grocery store exits but not dollar store entries) and consistently find that grocery store exits lead to a reduction in fresh produce spending for low-income households.

¹⁷Frozen produce spending increases following three or more entries only for households in income bins 4 and 5 (\$15,000 to \$25,000 per year). The effect does not display the monotonicity found for fresh produce spending and displayed in [Figure 4](#).

Table 8: Decomposition of the Effect of DS Entry (0-2mi) on Fresh Produce Spending

	Dependent Variable: Spending on Fresh Produce			
	(1)		(2)	
	Balanced		Balanced	
High income				
× First DS Entry	2.010	(1.177)	1.223	(1.191)
× Two DS Entries	-1.414	(2.008)	-2.567	(2.067)
× Three+ DS Entries	-3.378	(3.027)	-4.493	(3.153)
Low income				
× First DS Entry	-7.488***	(1.265)	-5.168***	(1.272)
× Two DS Entries	-11.58***	(2.145)	-6.647**	(2.196)
× Three+ DS Entries	-15.86***	(3.146)	-8.174*	(3.257)
High income				
× First GS Exit			1.782	(1.240)
× Two GS Exits			1.657	(1.897)
× Three+ GS Exits			-0.610	(2.738)
Low income				
× First GS Exit			-6.827***	(1.171)
× Two GS Exits			-11.81***	(1.750)
× Three+ GS Exits			-13.51***	(2.672)
Observations	246,851		246,851	
F-stat	7.25		7.61	
R^2	0.74		0.74	
Adjusted R^2	0.72		0.72	
Spending Pre-Entry	146.4		146.4	

Notes: Unit of observation is the household-year. Standard errors (in parenthesis) clustered at the household level. Year and household fixed effects are included. Controls for time-varying household demographics (income, education, age, household size, marital status, occupation, weekly hours worked) are included. The balanced panel corresponds to households observed for at least 9 years. Low income refers to households with annual income in bin 7 (\$35,000 to \$45,000) or lower. High income corresponds to households in bin 8 or higher.

Table 9: Effect of DS Entry (0-2mi) on Spending by Product Category

	Dependent Variable: Spending by Product Category						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
First DS Entry	-0.521 (0.399)	0.209 (0.344)	1.171 (1.939)	-0.588 (0.709)	-2.685* (1.301)	-0.900 (1.076)	1.604 (1.681)
Two DS Entries	0.190 (0.681)	0.920 (0.637)	-0.457 (3.388)	0.887 (1.247)	-1.554 (2.216)	-0.987 (1.840)	3.915 (2.939)
Three+ DS Entries	1.551 (1.010)	2.767** (0.990)	1.789 (5.065)	1.881 (1.843)	-0.572 (3.353)	2.152 (2.989)	7.898 (4.542)
Observations	246,851	246,851	246,851	246,851	246,851	246,851	246,851
F-stat	10.9	5.66	14.8	17.8	22.3	15.8	8.67
R^2	0.66	0.67	0.79	0.73	0.79	0.75	0.75
Adjusted R^2	0.62	0.63	0.76	0.70	0.77	0.72	0.72
Spending Pre-Entry	64.8	39.9	491.5	153.8	351.1	214.7	331.7

Notes: Unit of observation is the household-year. Standard errors (in parenthesis) clustered at the household level. Year and household fixed effects are included. Controls for time-varying household demographics (income, education, age, household size, marital status, occupation, weekly hours worked) are included. Results are shown for the balanced panel. Each column corresponds to a product category: (1) is canned produce, (2) is frozen produce, (3) is soda, snacks, candy and crackers, (4) is meals (incl. rice, pasta, soup), (5) is dairy, (6) is refrigerated and frozen meats, (7) is refrigerated and frozen baked goods, desserts, dough, and beverages.

Finally, we investigate whether these changes in fresh produce spending translate into meaningful changes in volumes consumed. While lower expenditures might reflect a reduction in consumption, it might also reflect the fact that consumers potentially face lower prices, if for instance, grocery stores respond to entry by lowering fresh produce prices. We isolate the effect on quantities purchased by computing volumes of fresh produce purchased. Figure 6 shows an event study plot of the effect of dollar store entry on the volume of fresh produce purchased in ounces. The results indicate that entry within 2mi of the household leads to a significant reduction in volumes of fresh produce purchased of approximately 5%. For completeness, we include the corresponding static analysis in Table A5 of Appendix A.

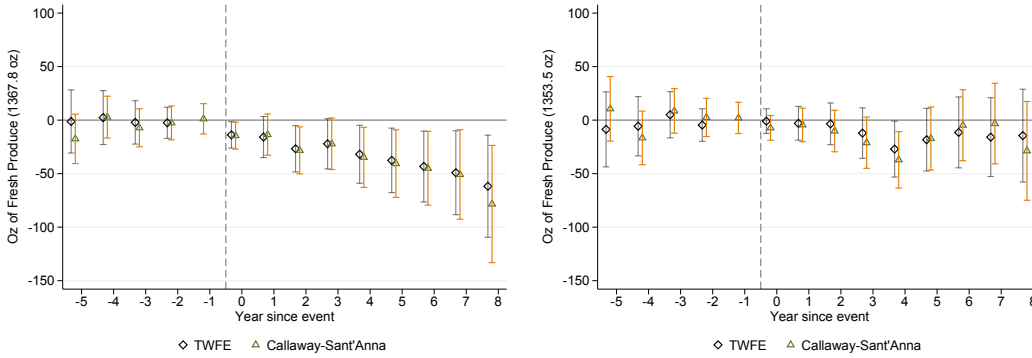


Figure 6: The effects of dollar store entry at the 0-2mi (left panel) and 2-5mi (right panel) bands on fresh produce volume purchased. Results are from an event study analysis on the balanced panel, using a TWFE and a heterogeneity-robust estimator proposed by Callaway and Sant’Anna (2021). Household and year fixed effects are included. Confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.

On the whole, the findings in sections 3.1 and 3.2 point to a large impact of dollar store expansion on market structure and a modest but significant impact on consumers’ dietary choices. The latter average effect masks important heterogeneity across consumers: low-income households (annual income below \$45,000) and households with high travel costs experience large declines in fresh produce spending whereas higher-income households are not affected.

While previous research (e.g., [Allcott et al. \(2019\)](#)) has shown that entry of grocery stores and supermarkets has economically small effects on healthy grocery shopping, the analysis above demonstrates that (1) grocery stores are driven out by dollar store entry in close proximity; (2) the exit of many grocery stores is associated with a moderate but significant reduction in spending on and volumes of fresh produce. This asymmetric impact of grocery store entries and exits on healthy grocery shopping may be tied to consumer inertia in store and brand choices ([Ho et al. \(1998\)](#), [Dubé et al. \(2010\)](#)). Inertia in households' shopping may create asymmetries in the response to positive or negative shocks to their retail environment.

4 Conclusion

The rise of dollar store chains has profoundly reshaped the U.S. retail sector. By 2021, more than 75 percent of the U.S. population lives within five miles of a dollar store. This rapid expansion has been met with growing scrutiny from policymakers. Proponents claim that dollar stores broaden shopping options and improve convenience for consumers in underserved areas. Advocates of tighter controls argue that these chains threaten local independent stores, discourage entry by full-line grocery stores, and limit consumers' access to fresh produce. In many municipalities, controls take the form of zoning ordinances that limit dollar store density.

Despite the extensive public policy debates, there remains a need for careful empirical evidence supporting the arguments advanced. This paper brings new data and methods to bear on these questions. We quantify the impacts of dollar stores' expansion and focus on two sets of outcomes. First, we consider market structure, that is, the geographic layout and number of retail stores by format. This outcome is particularly important as it affects retail proximity, convenience, and product variety. Second, we consider consumers' shopping behavior, including their spending across retail formats and food categories (e.g., fresh produce).

Our analysis demonstrates that dollar store entry leads to a significant re-

duction in the number of grocery stores, especially in close proximity (0–2mi) from the entry location. We find that markets lose one grocery store for every three new dollar stores. Dollar store entry and subsequent grocery store exits are associated with lower household spending and volumes purchased of fresh produce. Moreover, we highlight the distributional consequences of these findings: fresh produce consumption and grocery access decrease most for consumers who initially tend to eat less healthfully and have higher transportation costs—low income, older, from minority groups, without access to a vehicle. Overall, we find that negative shocks to food availability have a meaningful impact on consumers’ dietary choices. These results add nuance to the literature on the determinants of nutritional inequality.

The welfare implications of dollar store expansion are arguably multifaceted. Dollar store entry may affect consumer welfare through changes in prices (both at dollar stores and through their competitors’ response), changes in store convenience (or travel costs), and changes in product availability and the ensuing composition of consumers’ shopping baskets. In the medium to long-run, changes in consumers’ dietary choices can have important implications for health outcomes. While the existing data and the many channels above prevent an estimation approach that accounts for all these dimensions in a single model, we view this paper as a necessary first step in quantifying this impact and informing the debate around the place of the dollar store format in the U.S. retail landscape.

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A Supplementary Tables and Figures

Table A1: Household Spending by Retail Channel and Food Category in Cir-
cana Consumer Network (in \$ per year)

Variable	Mean	Median	Std.Dev
Aggregate Spending	2,908.3	2,560.4	1,753.1
Spending in Grocery Channel	1,765.8	1,456.4	1,422.7
Spending on Fresh Produce	88.6	52.7	112.7
Spending on Can/Frozen Produce	63.3	43.3	70.5
Spending on Soda, Snacks, Candy	227.4	159.5	235.4
Spending on Dairy	221.7	169.8	205.7
Spending on Refg./Frozen Meat	127.0	85.3	142.9
Spending on Meals	94.3	66.9	98.9
Spending on Frozen Other	145.5	92.6	175.9
Spending in Dollar Channel	33.7	1.0	108.6
Spending on Fresh Produce	0.6	0.0	7.0
Spending on Can/Frozen Produce	1.2	0.0	6.4
Spending on Soda, Snacks, Candy	14.6	0.0	45.4
Spending on Dairy	1.5	0.0	10.5
Spending on Refg./Frozen Meat	0.9	0.0	8.0
Spending on Meals	2.8	0.0	14.9
Spending on Frozen Other	1.6	0.0	13.1
Spending in SC/Club Channel	767.0	377.4	1,027.2
Spending on Fresh Produce	38.6	7.8	83.4
Spending on Can/Frozen Produce	27.3	6.9	51.8
Spending on Soda, Snacks, Candy	134.8	58.0	206.2
Spending on Dairy	87.0	27.1	142.3
Spending on Refg./Frozen Meat	71.0	20.0	123.8
Spending on Meals	37.7	11.0	66.4
Spending on Frozen Other	57.8	12.7	115.9
Spending in Convenience Channel	14.4	0.0	88.0
Spending on Fresh Produce	0.1	0.0	4.0
Spending on Can/Frozen Produce	0.1	0.0	2.0
Spending on Soda, Snacks, Candy	3.3	0.0	24.2
Spending on Dairy	1.6	0.0	13.4
Spending on Refg./Frozen Meat	0.2	0.0	3.9
Spending on Meals	0.2	0.0	3.5
Spending on Frozen Other	0.4	0.0	6.4
Observations (Household-Year)	618,621		

*Note: SC/Club stands for Supercenter and Club store retail channel.
Meals includes products such as pasta, rice, and soup.*

Table A2: Household Demographics by Number of DS Entries in Circana Consumer Network

Variable	All Panelists	By Number of DS Entries			
		0	1	2	3+
Income (000s)	66.81 (43.90)	68.67 (44.64)	64.89 (43.01)	62.77 (41.99)	59.30 (40.07)
Low-Income (<35k)	0.27 (0.45)	0.26 (0.44)	0.29 (0.45)	0.30 (0.46)	0.32 (0.46)
High-Income (>100k)	0.17 (0.38)	0.18 (0.39)	0.16 (0.36)	0.14 (0.35)	0.12 (0.32)
Years education	14.64 (2.15)	14.67 (2.14)	14.60 (2.16)	14.62 (2.17)	14.63 (2.18)
No female head	0.10 (0.30)	0.09 (0.28)	0.11 (0.31)	0.13 (0.34)	0.15 (0.36)
No male head	0.26 (0.44)	0.24 (0.43)	0.28 (0.45)	0.31 (0.46)	0.36 (0.48)
With children	0.22 (0.41)	0.26 (0.44)	0.17 (0.38)	0.13 (0.34)	0.13 (0.33)
Age	56.17 (13.12)	54.72 (13.42)	57.98 (12.49)	59.36 (11.96)	60.04 (11.27)
Household Size	2.38 (1.29)	2.49 (1.33)	2.25 (1.21)	2.11 (1.17)	2.08 (1.21)
White	0.82 (0.39)	0.84 (0.37)	0.82 (0.39)	0.75 (0.43)	0.65 (0.48)
Black	0.10 (0.30)	0.08 (0.27)	0.10 (0.31)	0.17 (0.38)	0.28 (0.45)
Married	0.64 (0.48)	0.67 (0.47)	0.62 (0.48)	0.56 (0.50)	0.50 (0.50)
Employed	0.56 (0.50)	0.59 (0.49)	0.53 (0.50)	0.48 (0.50)	0.45 (0.50)
No vehicle	0.03 (0.18)	0.03 (0.16)	0.03 (0.18)	0.06 (0.23)	0.09 (0.29)
Observations	618,621	381,672	158,875	51,341	26,733

Note: The unit of observation is the household-year. The table shows mean values and standard errors are shown in parenthesis. The four right-most columns show the subsample of households who experienced a given number of entries over the sample period (2010-2019). For households with two household heads, we use the mean of age, employment hours, educational attainment for male and female household heads.

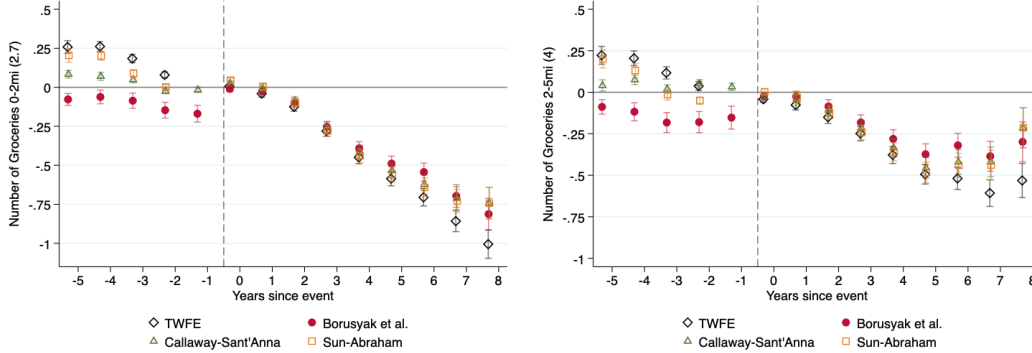


Figure A1: The effects of dollar store entry at the 0-2mi and 2-5mi bands on the number of independent grocery stores. Results are from an event study analysis on the balanced panel, using a TWFE and heterogeneity-robust estimators proposed by [Borusyak et al. \(2021\)](#), [Sun and Abraham \(2021\)](#), and [Callaway and Sant'Anna \(2021\)](#). For the latter paper, confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.

Table A3: Effects of DS Entry (0-2mi) By Store Type

	(1)	(2)	(3)	(4)	(5)	(6)
	Grocery Stores	Convenience Stores	Combination Stores	Supermarkets	Supercenters	Other Dollar Stores
First DS Entry	-0.0729*** (0.0138)	0.0121* (0.00589)	-0.0158** (0.00576)	-0.0421*** (0.00425)	-0.00395 (0.00431)	0.00362** (0.00135)
Two DS Entries	-0.327*** (0.0267)	-0.0286** (0.0103)	-0.00318 (0.00993)	-0.0723*** (0.00781)	-0.0335*** (0.00767)	0.0317*** (0.00274)
Three+ DS Entries	-1.041*** (0.0511)	-0.122*** (0.0173)	0.0495** (0.0167)	-0.135*** (0.0131)	-0.0176 (0.0137)	0.0721*** (0.00483)
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Business Density	Yes	Yes	Yes	Yes	Yes	Yes
Census Tract FE	Yes	Yes	Yes	Yes	Yes	Yes
Market*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	557,635	557,635	557,635	557,635	557,635	557,635
F-stat	79.4	29312.3	567.7	75.6	8.23	94.4
R^2	0.99	1.00	0.95	0.98	0.98	0.89
Adjusted R^2	0.98	1.00	0.94	0.98	0.97	0.86
Mean Pre-Entry	2.71	6.24	0.70	1.70	1.61	0.074

Notes: Unit of observation is the location-year. Standard errors (in parenthesis) clustered at the location level. Controls for time-varying local demographics (income, population, residential rents, and the one-year percent change in each) and business density are included.

Table A4: Effects of DS Entry (0-2mi): Robustness to Nearby Entry

	(1)	(2)
	All Markets	Markets without Nearby Entry
First DS Entry	-0.0729*** (0.0138)	-0.0874*** (0.0208)
Two DS Entries	-0.327*** (0.0267)	-0.165*** (0.0440)
Three+ DS Entries	-1.041*** (0.0511)	-0.647* (0.279)
Demographic Controls	Yes	Yes
Business Density	Yes	Yes
Census Tract FE	Yes	Yes
Market*Year FE	Yes	Yes
Observations	557,635	60,172
F-stat	79.4	7.35
R^2	0.99	0.96
Adjusted R^2	0.98	0.93
Mean Pre-Entry	2.71	2.71

Notes: Column (2) only uses observations with no dollar stores entrants in the 2-5mi and 5-10km radii at any point during the sample period. The unit of observation is the location-year. Standard errors (in parenthesis) clustered at the location level. Controls for time-varying local demographics (income, population, residential rents, and the one-year percent change in each) and business density are included.

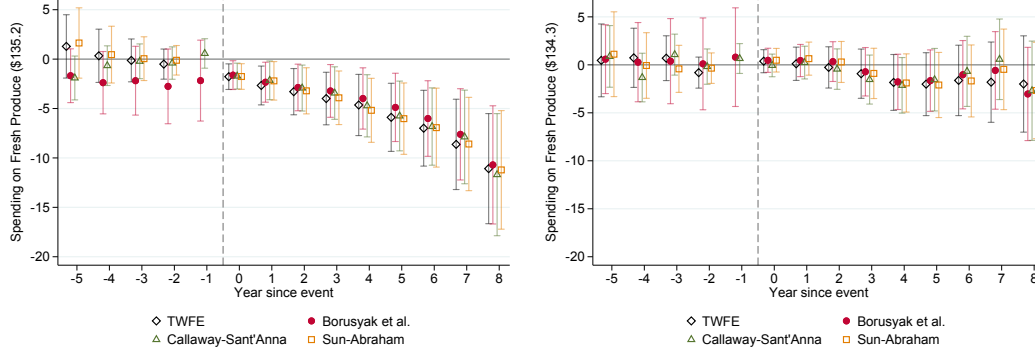


Figure A2: The effects of dollar store entry at the 0-2mi and 2-5mi bands on spending on fresh produce. Results are from an event study analysis on the balanced panel, using a TWFE and heterogeneity-robust estimators proposed by [Borusyak et al. \(2021\)](#), [Sun and Abraham \(2021\)](#), and [Callaway and Sant'Anna \(2021\)](#). For the latter paper, confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.

Table A5: Effect of DS Entry (by distance band) on Total Oz of Fresh Produce, and Total Fat, Sugar, Sodium Purchased

	0-2mi				2-5mi			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Fresh Produce (Oz)	Fat (g)	Sugar (g)	Sodium (mg)	Fresh Produce (Oz)	Fat (g)	Sugar (g)	Sodium (mg)
First DS Entry	-10.40 (8.656)	-37.04 (126.2)	409.9 (227.8)	-3086.3 (6390.3)	0.669 (7.956)	-82.97 (120.4)	-70.19 (197.4)	-2923.6 (6116.1)
Two DS Entries	-38.87** (14.79)	328.5 (216.1)	611.0 (457.8)	10186.6 (10539.3)	-14.43 (10.90)	1.263 (166.7)	96.61 (290.6)	518.9 (8592.3)
Three+ DS Entries	-55.24* (21.45)	340.1 (331.4)	-22.77 (944.9)	29150.4 (16584.6)	-27.94* (14.13)	57.51 (209.0)	204.6 (394.4)	5316.9 (10478.1)
Observations	246,851	246,851	147,512	246,851	246,851	246,851	147,512	246,851
F-stat	8.47	29.3	10.4	23.2	8.49	29.3	10.3	23.1
R ²	0.75	0.80	0.87	0.71	0.75	0.80	0.87	0.71
Adjusted R ²	0.72	0.77	0.84	0.68	0.72	0.77	0.84	0.68
Mean Pre-Entry	1,444	38,133	60,586	1,460,188	1,426	39,528	62,367	1,515,818

Notes: Unit of observation is the household-year. Standard errors (in parenthesis) clustered at the household level. Year and household fixed effects are included. Controls for time-varying household demographics (income, education, age, household size, marital status, occupation, weekly hours worked) are included. Results are shown for the balanced panel.

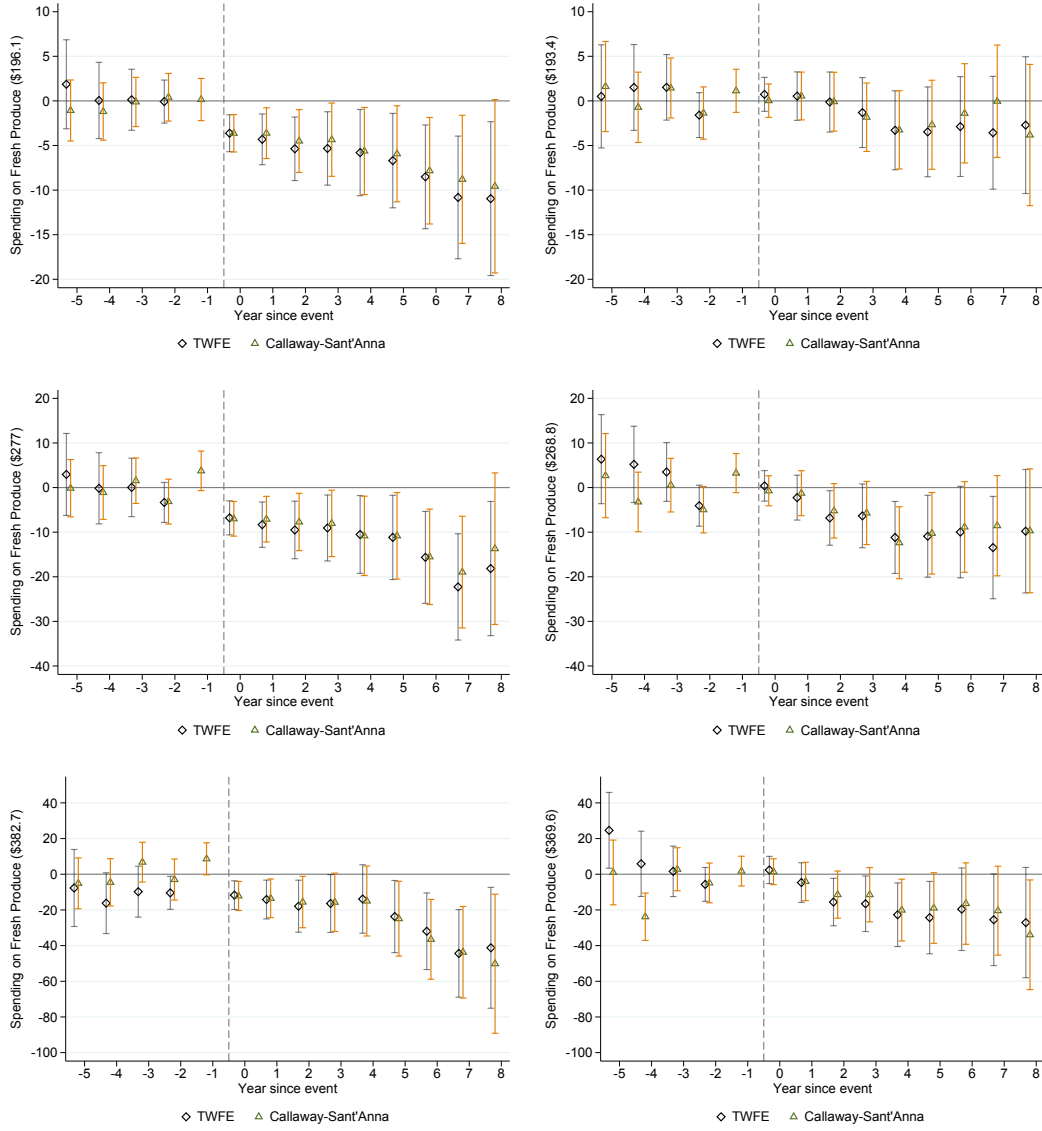


Figure A3: The effects of dollar store entry at the 0-2mi (left panels) and 2-5mi (right panels) bands around the household on fresh produce spending. Results are from an event study analysis on the balanced panel for households who reported spending for at least 10 (top panels), 20 (middle panels), and 30 (bottom panels) weeks per year. Estimates use a TWFE and a heterogeneity-robust estimator proposed by [Callaway and Sant'Anna \(2021\)](#). Household and year fixed effects are included. Confidence bands show the uniform sup-t confidence intervals adjusted for multiple hypothesis testing.