Price Consciousness at the Peak of "Impatience" ⧉ ⧉

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ABSTRACT

Past studies consistently document that consumption among low-income households spikes after income receipt and then subsequently declines. Using two approaches to analyze linked survey and administrative data on food purchases, we find that SNAP recipients are most price-conscious and engage in their most successful price-saving efforts soon after benefit receipt. This contrasts with prior literature that posits recipients mistakenly feel "flush" with money after benefit receipt and injects forethought and savviness among SNAP recipients into the prevailing narrative that they lack self-control and capability. The frequency of benefit receipt may act as a savings commitment device that funds price-saving efforts.

I. Introduction

Past research has documented many instances of low-income households not smoothing consumption between pay receipts. Wilde and Ranney (1998), Shapiro (2005), and Todd (2015) find that households receiving monthly food assistance benefits consume less food towards the end of their benefit month than towards the beginning of it. Similar patterns have been documented for Social Security recipients and monthly/bimonthly income recipients.[1] There are several possible drivers for these observed "impatient" pay cycle consumption patterns. Shapiro (2005), Mastrobuoni and Weinberg (2009), and Huffman and Barenstein (2005) conjecture that consumers possess present-biased preferences and discount near-term consumption at a higher rate than they do consumption occurring further out in the future. That is, consumers plan to be patient in the future but end up violating this consumption plan when that time period arrives at the present. In a pay cycle this will manifest in consumers consistently consuming more than planned towards the beginning of a pay cycle and, consequently, less than previously planned towards the end of a pay cycle due to budget and credit constraints. Huffman and Barenstein (2005) propose an alternate explanation for pay cycle impatience. They conjecture that consumers mistakenly perceive that a feeling of being "flush" with money at the beginning of a pay cycle will persist throughout the pay cycle. As a result, consumers overconsume at the beginning of the pay cycle, as they do not feel that a dollar spent during this time is very costly. Eventually, every dollar spent feels more and more costly as the consumer progresses through the pay cycle and available funds dwindle.

How should the possible drivers for pay cycle consumption patterns impact the prices at which consumers acquire goods? If consumers mistakenly feel more permanently flush with money at the beginning of the pay cycle, then they should correspondingly be less sensitive to price at that point in the pay cycle. If consumers lack self-control due to present bias, then they may put off engaging in costly price-saving efforts during shopping trips at that time. Both of these possible drivers of impatient consumption patterns could explain/produce counter-cyclical price sensitivity across the pay cycle.

If, however, there were evidence that consumers acquire goods at relatively cheaper prices at the beginning of the pay cycle, then it would preclude that households mistakenly feel "flush" at the beginning of the pay cycle. Consumers could nonetheless be present-biased and concurrently acquire goods at relatively cheaper prices at the beginning of the pay cycle if future returns from price-saving shopping efforts at the beginning of pay cycles outweigh their immediate costs. The *timing* of income distribution may coincide with the ability of consumers to obtain greater returns on shopping effort if price-saving efforts require access to lump sums of liquidity and if infrequent income distribution effectively acts as a savings commitment device for present-biased consumers (Casaburi and Macchiavello 2019).

We investigate the pattern of prices paid for goods across the pay cycle for households known to demonstrate nonsmooth pay cycle consumption patterns. Specifically, we use

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1. Stephens (2003) and Mastrobuoni and Weinberg (2009) find impatient consumption/spending patterns among Social Security recipients, Huffman and Barenstein (2005) and Stephens (2006) among U.K. households who receive monthly income checks, and Zaki (2016) among U.S. military families who receive bimonthly paychecks.

household food purchasing data from the USDA's nationally representative National Household Food Acquisition and Purchase Survey (FoodAPS) combined with weekly store sales scanner data to study price patterns across the benefit month among households participating in the Supplemental Nutrition Assistance Program (SNAP, the largest U.S. food assistance program). The timing of SNAP benefit receipt each month varies across participants, as benefits are not paid out on the same day in the calendar month to all program participants. We use two different techniques to determine price patterns across the benefit month. In the first technique, we construct two household-level price indexes, following Aguiar and Hurst (2007), that measure how expensive baskets of purchased goods are relative to their contents' average prices at a point in time. One price index incorporates average prices from administrative data at the universal product code (UPC)–week level, and the other incorporates average prices from survey data at the food category–month level. Analysis of these two price indexes finds that households shopping at the beginning of the benefit month pay prices that are 1–2 percent lower than households shopping at the end of their benefit month. Benefit month price differences are even larger if we only examine foods in categories that are frequently purchased throughout the benefit month (prices paid for these goods are 2–5 percent lower at the beginning of the benefit month than towards the end of the benefit month).

In the second technique, we use store scanner data to examine what households would have paid had they made their exact same purchase from the exact same store one, two, or three weeks later. We find that the prices of foods purchased by households surveyed at the beginning of the benefit month are 1.7–2.2 percent higher two weeks later for all foods and 3.1–3.4 percent higher for foods in categories that are frequently purchased throughout the benefit month. By contrast, we find that the prices of foods purchased by households surveyed at the end of the benefit month generally are not different two and three weeks following purchase. Hence, SNAP households have a greater agency or inclination to purchase goods at temporarily discounted prices at the beginning of the benefit month than towards the end of it. We show that these differences in prices are not driven by differences in characteristics of households who shop at the beginning and end of the benefit month. We also find that SNAP households maintain a high and unchanging probability of shopping throughout the benefit month.

We then investigate possible explanations for the price patterns we find. We do not find evidence that stores themselves systematically adjust prices at the beginning of benefit months. Neither weekly movements of store-level baskets of goods nor goods bought by non-SNAP households follow the same price patterns as those of SNAP households. We find evidence, however, that households engage in greater amounts of price-saving shopping efforts towards the beginning of benefit months, with some of these efforts potentially requiring access to lump sums of liquidity.

To the best of our knowledge, this is the first work to demonstrate that households who appear to be very impatient have a price consciousness that is pro-cyclical with consumption patterns. Two other papers (Cheng and Beatty 2016; Valizadeh, Smith, and Ver Ploeg 2021) arrive at opposite findings, concluding that SNAP households buy goods at higher prices towards the beginning of the benefit month. Our findings are based on more detailed price data, investigating prices at the UPC (rather than at the product category) level, circumventing confounding factors that arise when comparing

prices of nonidentical goods. Also, in contrast to prior research, we use a research design that does not depend on each household making food acquisition trips on multiple days in the seven-day survey period, a requirement that may be more systematically violated by those surveyed closer to the end of the benefit month.[2] Our results are consistent across these two disparate approaches, as well as the use of UPC-level analysis.

This paper contributes to the growing literature on household behaviors and timing of income receipt by adding analysis on price consciousness, shopping effort, and efficiencies brought on by infrequent lump-sum income. This literature includes studies on consumption and spending patterns over the pay cycle (for example, Stephens 2003; Wilde and Ranney 1998; Shapiro 2005; Hastings and Washington 2010; Todd 2015; Mastrobuoni and Weinberg 2009; Huffman and Barenstein 2005; Stephens 2006; Zaki 2016; Dorfman et al. 2018), as well as crime (Foley 2011; Carr and Packham 2019), and health and mortality (Dobkin and Puller 2007; Evans and Moore 2011, 2012).

This work also contributes to literature that uses scanner or expenditure diary data to analyze household shopping behaviors. A subset of these papers specifically examine whether low-income households pay more for goods than higher-income households or if they engage in specific price-saving shopping strategies (Beatty 2010; Broda, Leibtag, and Weinstein 2009; Griffith et al. 2009; March et al. 2020). These studies find that low-income households acquire goods at lower prices in comparison to their higher-income counterparts. We add to this by showing that SNAP households obtain lower prices at the beginning of their benefit month.

The rest of the paper proceeds as follows: Section II describes the data sets used, Section II presents price analysis, Section IV presents shopping effort analysis, and Section V concludes.

II. Data and Sample

To determine how prices for the same goods differ across the benefit month, we need information that includes day of benefit receipt, day of purchase, and details about individual goods purchased.

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2. Whereas we assign one price index value to each household, aggregating over all purchases made in a seven-day survey period, Cheng and Beatty (2016) and Valizadeh, Smith, and Ver Ploeg (2021) use as a main outcome the observations of price per unit weight of each item purchased on every given survey day. They regress this outcome variable on week-in-benefit-month or multiday-in-benefit-month indicator variables. Because they include household fixed effects, identification would require that households make food acquisition trips on separate days in their seven-day survey period and for those days to straddle different portions of their time-in-benefit month indicators to contribute to the estimated effects. Potentially, fewer households fulfill this behavior towards the end of the benefit month. Furthermore, the specifications used in Cheng and Beatty (2016) and Valizadeh, Smith, and Ver Ploeg (2021) weight items purchased by a household equally regardless of whether the item represents a small portion of total expenditures or a large portion. By contrast, items in our analysis that correspond to a larger percent of expenditures for a household will influence the price index more. As a note, our main specification compares prices obtained in the first half of the benefit month with prices obtained in the second half of the benefit month. The resulting documented benefit month pattern of price acquisition remains even if we use other multiday-in-benefit-month splits as well. Finally, our analysis utilizes the latest version of the FoodAPS data set that includes explicit day of benefit month information and updated confirmations of SNAP participation. By contrast, Valizadeh, Smith, and Ver Ploeg (2021) use a preliminary version of Food-APS in their analysis that lacked that updated and confirmed information. As a result, they had to construct some of these measures, including day since last benefit. Our samples of SNAP participating households also differ as a result.

A. Data

The main data we use come from FoodAPS, which includes detailed information on household food purchases and acquisitions from a nationally representative sample of noninstitutionalized households in the contiguous United States. Households enter the sample continuously over the survey period (which spans from April 2012 to January 2013), and each household records all food purchased and otherwise acquired by all members over a seven-day period. The sample design stratified households into four subgroups, such that estimates could be computed separately for each group: households participating in SNAP and three groups of non-SNAP households (income below the poverty guideline, income at or above 100 percent and less than 185 percent of the poverty guideline, and income 185 percent of the poverty guideline or higher).[3] There are 4,826 households in the survey.

Since SNAP benefits can only be used to purchase food intended for home consumption, we focus analysis on this subset of foods, referred to as food at home (FAH). For FAH, survey households provide itemized receipts for purchased food items to identify item prices and can also record prices of items purchased when a receipt is not available. Households also scan item barcodes so that they can be matched to detailed product descriptions, package size information, and product categories through an item-level product dictionary from IRI, a market research company. For items purchased by weight, such as fresh produce, meat, and seafood, respondents scan a generic barcode in their survey booklet and then provide size and quantity information. Each food item that a FoodAPS household reports is matched to a USDA food category (see Online Appendix B for details).

Receipts and survey respondents also provide event-level information, such as store name and location, total paid for the whole FAH transaction (including nonfood items and taxes), payment method(s), whether respondents used any coupons, and if there were any store-level savings (for example, $10 off at checkout for total purchases of $100 or more). Furthermore, households provide demographic information, as well as information about food shopping preferences, diet, and health.

FoodAPS includes information on SNAP participation (both self-reported and matched to administrative caseload data). SNAP households receive benefits once per month but on different days in the month based on state issuance schedules. In the survey, SNAP households are asked to report the date on which they most recently received SNAP benefits. Because households enter into the survey continuously over time, we observe households at different points in their SNAP month (see Online Appendix Figure 1). For our main analysis, we split these households into two groups based on when they were surveyed relative to their benefit receipt: those with any survey days within seven days since benefit receipt are coded as being in the first half of the SNAP month, and all other households are considered to be in the second half of the SNAP month (see Online Appendix Table 1).

Finally, IRI provides access to weekly store item-level transaction (that is, scanner) data that includes revenue and sales quantities for each IRI store.[4] We combine this with

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3. Due to their smaller sample sizes, we combine the two lowest-income non-SNAP groups for analysis.
4. These IRI stores are a subset of all food stores in the United States and, therefore, a subset of all stores that FoodAPS households report shopping at during their survey week.

FoodAPS provided location information of stores that are within 20 miles of the block groups in which each FoodAPS household resides to calculate local average weekly prices of items. FoodAPS also provides weekly prices of the Thrifty Food Plan (TFP) for each IRI store located in or adjacent to a county that is sampled in FoodAPS.[5]

B. Descriptive Statistics

Sample characteristics are summarized in Online Appendix Table 2. SNAP households (Column 1) on average are made up of 2.9 members, including 1.06 children, 1.66 adults, and 0.75 workers. Around 28 percent of SNAP households live in a rural census tract, and 69 percent of them have a car or access to a car when they need it. SNAP households have, on average, 0.54 SNAP-authorized supermarkets or superstores within half a mile of their residence and live, on average, 1.9 miles away from their nearest SNAP authorized supermarket or superstore. On average, SNAP households make 3.5 FAH shopping trips over 2.55 days in their seven survey days. Altogether, they spend on average $95.32 over the seven survey days at events that include FAH purchases, of which $75.53 are solely on pre-tax food items.[6] They spend on average $32.59 on food away from home (FAFH) events during the seven survey days.

SNAP households have significantly younger primary survey respondents, more members (including more children), more nonworking adults, are more likely to include minorities, and are less likely to have car access than their non-SNAP counterparts (Online Appendix Table 2, Columns 2 and 3). SNAP households spend more at FAH and FAFH events than do low-income non-SNAP households, but less than do higher-income non-SNAP households. SNAP households also engage in more FAH events over their seven survey days than do non-SNAP households. SNAP households are significantly more likely than higher-income non-SNAP households to report choosing a primary store due to store prices and correspondingly less likely to choose a primary store due to store food variety.

Online Appendix Table 3 provides information on income for our three household groups. We see that SNAP households have an average monthly household income of $2,051 and are on average at 128.6 percent of the poverty guideline. Just over half of SNAP households have earnings. Approximately 50 percent of SNAP and low-income non-SNAP households receive disability or retirement income, which makes up a very large portion of overall income (76–84 percent) conditional on receipt. Disability and retirement income is typically disbursed at monthly frequencies in lump sums. That means that a significant percentage of SNAP and low-income non-SNAP households receive fairly lumpy and infrequent pay.[7] By contrast, a much higher percentage of higher-income non-SNAP households have earnings (83 percent). Furthermore, if

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5. The TFP is a food plan developed by the USDA that specifies types and amounts of food that will provide adequate nutrition at the lowest possible cost and is used to set the maximum SNAP benefit amount. Weekly TFP data in this component provides a weekly median and tenth percentile price for 29 categories of food that make up the TFP. We use the tenth percentile TFP prices in analysis.

6. Spending at events that include FAH purchases includes spending on food items, nonfood items (for example, detergent, paper towels), and taxes.

7. This is consistent with the fact that low-income non-SNAP households include more seniors than other household types (see Online Appendix Table 2) and may therefore be more likely to receive Social Security income. As a note, Supplemental Security Income payments (which are accessible to younger individuals) tend

Table 1
Average Characteristics and Behaviors across the Benefit Month

	First Half of SNAP Month	Second Half of SNAP Month	Difference	N
At least one food-at-home event over 7 days	0.91	0.92	−0.02 (0.03)	1,548
Total spending at food-at-home events	146.59	81.61	64.98*** (5.28)	1,304
Total spending on food-at-home food items	122.31	61.93	60.38*** (5.37)	1,304
Total food-away-from-home spending	33.72	37.09	−3.37 (4.43)	1,304
Number of people at residence, excluding guests	3.02	2.89	0.13 (0.16)	1,304
Number of children in household	1.14	1.02	0.13 (0.12)	1,304
Number of seniors (age ≥65) in household	0.16	0.25	−0.09** (0.04)	1,304
Rural tract	0.28	0.31	−0.03 (0.04)	1,304
SNAP last received (including estimated amounts)	262.19	250.26	11.92 (16.63)	1,298
Household average (monthly) income	2,070.60	2,180.88	−110.28 (240.35)	1,304
Total income as percent of poverty guideline	123.16	138.83	−15.67 (13.38)	1,304
Household has a car or access to a car when needed	0.69	0.73	−0.04 (0.04)	1,304
Number of supermarkets/superstores within 0.5 miles of household	0.64	0.52	0.12 (0.10)	1,304
Miles to nearest SNAP-authorized supermarket/superstore	2.10	1.96	0.14 (0.57)	1,304

Source: Authors' estimates using FoodAPS data.
Note: 1,548 SNAP households had a nonmissing date of last SNAP receipt and reported on shopping, including confirming no shopping occurrences. Of those households, 1,304 shopped at least once during the survey week. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received.

higher-income non-SNAP households do receive any type of unearned income, it makes up a smaller percentage of their overall income.

Before analyzing price patterns across the SNAP month, we first demonstrate that there is enough variation to measure differences in prices faced across the month. We find that (i) SNAP households make food shopping trips throughout the SNAP month and (ii) that those who shop at the end of the SNAP month do not look different from those who shop at the beginning of the SNAP month. Table 1 compares shopping and demographic characteristics of SNAP households across the benefit month.[8] About 90 percent of SNAP households make at least one non-free FAH shopping trip in the seven-day survey period, regardless of when they are observed in the SNAP month; in other words, SNAP households do not shop only at the beginning of the SNAP month. Moving from the extensive margin to the intensive margin, we see in Table 1 that even though it is significantly lower than in the first half of the benefit month, seven-day total FAH spending in the second half of the month is not trivial. Seven-day conditional FAH food spending in the first and second half of the benefit month averages \$122.31 and \$61.93, respectively. Unlike FAH spending, food away from home (FAFH) spending does not significantly change across the benefit month.

We also see in Table 1 that the demographic composition and geographic food environment of SNAP households are not significantly different across the benefit month, with one exception. Households observed shopping in the second half of the SNAP month tend to be composed of more seniors than those observed shopping in the first half of the SNAP month. Aguiar and Hurst (2007) find that seniors obtain food at cheaper prices than younger households do. Hence, this compositional difference, if not controlled for, could skew price savings towards the second half of the SNAP month.

III. Benefit Month Price Analysis

Our first approach to analyzing price movements of acquired foods across the benefit month is to construct a price index that compares actual prices paid to average local prices at the time of purchase. Using this technique, we find that SNAP households pay 1–5 percent less for goods at the beginning of the benefit month than towards the end of it.

A. Technique 1: Price Index at Time-of-purchase

1. Price index construction and methodology

We construct a price index following Aguiar and Hurst (2007). The price index compares the actual cost of a household's basket of acquired goods to the cost of that basket at the average price of those goods. Specifically, let us denote the price of good $i \in I$ purchased by household $j \in J$ living in block group $g \in G$ on date $d \in D$ by $p_i^{j,g,d}$ and the

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to be issued towards the beginning of the calendar month, while Social Security income payments (which are mostly accessible only to older individuals) are issued throughout the calendar month.

8. Of the 1,581 SNAP households in the survey, 1,548 have both an identified SNAP benefit day of the month and at least one member reporting food acquisition events (or confirming no food acquisition events). Other than for the first variable summarized in this table, we only include SNAP households that did shop during their survey period at a non-free FAH event. We show balance statistics for this specific population to confirm that any differences of prices of goods acquired across the benefit month are not driven by differences in household or food environment characteristics.

corresponding total quantities in units or grams bought over the same period by $q_i^{j,g,d}$. Then the cost of food bought by household j over the seven survey days is:

$$X^{j,g,d} = \sum_{i \in I, d \in D} p_i^{j,g,d} \, q_i^{j,g,d}.$$

We then calculate two measures of average local price of good i in block group g bought on date d, $\overline{p_i^{g,d}}$, that differ by price source, specificity of the definition of goods, time range for averaging, and geographic reference unit.[9] The first is the average weighted price of good i as identified by its UPC, sold in the same IRI week of date d at IRI stores within a 20-mile radius of the centroid of each block group g in which a household resides.[10] UPC is a very granular level of food identifier that has a one-to-one relationship with an item's barcode. There is a different UPC code for each brand, flavor, and size of an item. Prices for this UPC-based average local price of a good come from IRI administrative store scanner data.

UPC-based average local prices will not include prices from non-IRI stores or prices for goods whose UPCs do not match those in the IRI database. Also, UPC-based average local prices may not reflect actual prices paid, as they may not fully incorporate coupons. To check that these shortcomings of UPC-based local average prices are not driving results, we construct a secondary measure of average local prices based directly on reported prices paid by FoodAPS participants. FoodAPS provides receipt-reported prices that are inclusive of coupons and discounts and includes price information of goods bought at non-IRI stores. FoodAPS also links goods to USDA food categories even if their UPCs are not available in the IRI database.[11] Specifically, we measure the average price paid per gram of all goods from the same four-digit USDA food category of good i bought by FoodAPS households living in the PSU of g in the month of date d.[12] Of course, because this food category–based average local price is measured at the food category level rather than at the UPC level, it may confound quality and price differences where the UPC-level analysis does not.

We use these two measures of average local price to calculate estimates of the cost of a household's food basket if each good had been purchased at its average local price:

$$\overline{X^{j,g,d}} = \sum_{i \in I, d \in D} \overline{p_i^{g,d}} \, q_i^{j,g,d}$$

where $q_i^{j,g,d}$ is number of units bought and total grams bought for the first and second measures of local average price, respectively. We create two corresponding price indexes, $I^{j,g,d}$, by dividing actual cost of a household's food basket by each of the two measures of average price of a household's food basket:

$$I^{j,g,d} = X^{j,g,d} / \overline{X^{j,g,d}}.$$

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9. Note that in both approaches we exclude goods obtained at free events.

10. IRI reports sales by week (seven days), with each week starting on a Sunday.

11. Food category codes are four digits long, where the first digit indicates the broadest category (such as 1 for dairy products), the first two digits indicate a subcategory (such as 10 = white milks), and the full four-digit code provides the most detailed information of the products in that category (such as 1002 = whole milk).

12. The FoodAPS sample includes 50 Primary Sampling Units (PSUs), made up of counties or groups of counties. Block groups are subunits of PSUs.

Finally, we normalize the index by dividing by the average price index of all households within the same PSU so that the index is centered around one for each PSU. A price index above one implies that a household pays more than average for the goods in its basket, and a price index below one implies that a household pays less than average for the goods in its basket. For analysis, we regress each household's normalized price index on the indicator for being observed in the first half of the SNAP month, including controls for PSU.

2. Results

We find that SNAP households pay less to acquire foods at the beginning of the benefit month than towards the end of it. As shown in Table 2, Column 1, the highly specific UPC-based price index shows that SNAP households pay prices that are 2 percent lower in the first half of the month. Results are essentially unchanged when demographic and food environment controls are included in Column 2.[13] The more aggregate food category–based price index (Columns 3 and 4) shows similar patterns, with SNAP households paying 1 percent lower prices on their purchased goods at the beginning of the month. These benefit month price differences are statistically significant at the 1 percent level for both price indexes, with or without the inclusion of demographic and food environment controls.

Can the results from the previous exercise be driven by changes in the composition of goods bought across the benefit month rather than by differences in prices paid for the same goods across the benefit month? For example, we could arrive at our results even if goods that are continually purchased throughout the benefit month (for example, perishables or staples) are always purchased at their respective local average prices if goods that tend to be only purchased at the beginning of the benefit month are purchased below average local prices. In such a scenario, our price index measured towards the beginning of the benefit month will appear to be lower than the price index measured toward the end of the benefit month, even though the goods that overlap throughout the benefit month are purchased at average prices. To investigate this scenario, we limit the price-index baskets to foods in categories that are commonly purchased throughout the benefit month.[14] This way, contents of price indexes are more homogenous across the benefit month. We find that our previous benefit month price differences persist and are even somewhat larger when we focus on goods that are commonly bought throughout the benefit month. Columns 7 and 8 show that, using the food category–based price index, SNAP households pay prices that are 5 percent lower at the beginning of the benefit month than towards the

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13. Demographic and food environment controls include indicator for the household reference person being Black, of other non-Hispanic nonwhite race/ethnicity, household size, number of children in the household, number of household members over age 60, number of household members employed, household monthly income, an indicator for owning/leasing a car or having access to a car when needed, household living in a rural census tract, number of supercenters and superstores within 0.5 miles of the home, and distance to the nearest supercenter or superstore.

14. We calculated the share of households who purchased at least one item within each two-digit USDA food category in the first half and second half of the benefit month. Categories in which foods are commonly bought throughout the SNAP month are those where at least 30 percent (the median observed share across all categories) of households purchased an item in that category in both the first and second half of the SNAP month. See Online Appendix Table 4 for a list of the two-digit food categories that meet this definition. Ninety-eight percent of shopping SNAP households acquired at least one good from this category in the second half of the benefit month, while 99 percent did so in the first half.

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Table 2
Price Index by Timing in SNAP Month

	All Foods				Foods Commonly Bought throughout the SNAP Month			
	UPC Price Index (1)	UPC Price Index (2)	Food Category Price Index (3)	Food Category Price Index (4)	UPC Price Index (5)	UPC Price Index (6)	Food Category Price Index (7)	Food Category Price Index (8)
First half of SNAP month	−0.020*** (0.004)	−0.019*** (0.004)	−0.010*** (0.002)	−0.011*** (0.001)	−0.021*** (0.002)	−0.022*** (0.002)	−0.050*** (0.002)	−0.051*** (0.002)
Observations	1,031	1,031	1,304	1,303	968	968	1,283	1,282
Demographics/food environment controls	No	Yes	No	Yes	No	Yes	No	Yes

Source: Authors' estimates using FoodAPS data and the FoodAPS IRI subset.

Notes: Significance: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. Survey weights applied in estimation and standard errors (in parentheses) adjust for complex survey design. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received. Columns 1–2 and 5–6 have as outcome variables price indexes that use UPC–week–local region IRI price data to compute average price for a good. Columns 3–4 and 7–8 have as outcome variables price indexes that use food category–month–psu FoodAPS survey price data to compute average price for a good. All regressions include controls for PSUs. Demographic and food environment controls include indicator for the household reference person being Black, of other non-Hispanic nonwhite race/ethnicity, household size, number of children in the household, number of household members over age 60, number of household members employed, household monthly income, an indicator for owning/leasing a car or having access to a car when needed, household living in a rural census tract, number of supercenters and superstores within 0.5 miles of the home, and distance to the nearest supercenter or superstore. Categories in which foods are commonly bought throughout the SNAP month are those where at least 30 percent (the median observed share across all categories) of households purchased an item in that category in both the first and second half of the SNAP month. See Online Appendix Table 5 for a list of the food categories that meet this definition.

end of the benefit month. Estimates using the UPC-based price index are little changed, indicating a 2 percent price savings at the beginning of the month (Columns 5 and 6). For comparison of magnitudes, Aguiar and Hurst (2007) find that older households pay 1.2–3.9 percent lower prices than their younger counterparts do.

B. Technique 2: Price Index through Time

In our next approach, we investigate if goods increase in price at their purchased stores in the weeks following their purchase. Using this approach, we see that SNAP households have a greater inclination to purchase goods at temporary discounts at the beginning of the benefit month than towards the end of it.

1. Methodology

In this approach, we analyze the agency of or inclination for SNAP households to obtain foods at temporary discounts depending on when they are shopping in the benefit month. Specifically, we investigate what households would have paid for their basket of goods if they made their exact same purchases, from the exact same stores, one, two, or three weeks later. All prices in this analysis are based on IRI weekly UPC-store-level scanner data and therefore are limited to purchased items whose UPCs and stores of purchase are available in the IRI data set.

We effectively create an index that measures the relative price of each household's purchased basket of goods through time at the store where it was purchased using UPC and store identification information. Specifically, we divide what a basket of purchased goods costs at the time of purchase (Week 0), and one, two, and three weeks after purchase by its purchase price in Week 0, normalizing the price index to one in Week 0 for each household. We regress this four-week price index panel on indicators for the number of weeks since purchase separately for households in the first half of the month and households in the second half of the month.

2. Results

As shown in Table 3, baskets that SNAP households purchase at the beginning of their benefit month increase in price at their stores of purchase by 1.7–2.2 percent two and three weeks after purchase, respectively (Column 1). In contrast, the overall price of baskets purchased later in the benefit month generally stays the same two to three weeks after purchase (Column 2). This suggests that households have greater inclination or ability to obtain goods at temporary price discounts at the beginning of the SNAP month relative to the end of the SNAP month. What types of foods are being purchased at temporary discounts? Are they foods that are purchased throughout the benefit month, or are they foods that tend to be purchased only at the beginning of the benefit month? Paralleling the findings in the previous section, we find that foods that are commonly bought throughout the benefit month drive our results, as shown in Columns 3 and 4. In Column 3, we see that the baskets of foods that are purchased throughout the benefit month increase in price by 3.1–3.4 percent two and three weeks after purchase, respectively, if they are bought at the beginning of the benefit month. They remain at the

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Table 3
Prices of Purchased Goods in Subsequent Weeks

	All Foods		Foods Commonly Bought throughout the SNAP Month		Foods More Commonly Bought in the First Half of the SNAP Month		Foods Less Commonly Bought in Either Half of the SNAP Month	
	Purchased First Half of SNAP Month	Purchased Second Half of SNAP Month	Purchased First Half of SNAP Month	Purchased Second Half of SNAP Month	Purchased First Half of SNAP Month	Purchased Second Half of SNAP Month	Purchased First Half of SNAP Month	Purchased Second Half of SNAP Month
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$t + 1$ week	-0.008	-0.014**	-0.003	-0.010+	-0.015**	-0.013+	0.003	-0.020*
	(0.008)	(0.005)	(0.012)	(0.006)	(0.006)	(0.008)	(0.010)	(0.011)
$t + 2$ weeks	0.017**	-0.002	0.034**	0.006	-0.004	0.008	0.018	-0.004
	(0.007)	(0.006)	(0.015)	(0.005)	(0.005)	(0.009)	(0.022)	(0.009)
$t + 3$ weeks	0.022**	0.002	0.031*	0.008	0.008+	0.007	0.012	0.003
	(0.009)	(0.006)	(0.016)	(0.006)	(0.005)	(0.011)	(0.014)	(0.009)
Observations	1,420	1,660	1,336	1,436	1,152	1,176	1,016	1,060

Source: Authors' estimates using FoodAPS data and the FoodAPS IRI subset.

Notes: Significance: $+p < 0.15$, $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. Survey weights applied in estimation and standard errors (in parentheses) adjust for complex survey design. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received. Categories in which foods are commonly bought throughout the SNAP month are those where at least 30 percent (the median observed share across all categories) of households purchased an item in that category in both the first and second half of the SNAP month. Categories in which foods are more commonly bought in the first half of the SNAP month are those where at least 30 percent of households purchased an item in that category in the first half of the SNAP month but less than 30 percent of households purchase an item from that category in the second half of the SNAP month. Categories in which foods are less commonly bought in either half of the SNAP month are those where less than 30 percent of households purchased an item in that category in both the first and second half of the SNAP month. See Online Appendix Table 5 for a list of two-digit food categories that meet these definitions.

same price levels in subsequent weeks, however, if they are bought towards the end of the benefit month (Column 4). By contrast, foods that are in categories that are more commonly purchased only at the beginning of the SNAP month and foods that are in categories that are rarely purchased in either half of the SNAP month stay at the same price levels in subsequent weeks regardless of when in the SNAP month they are bought (Table 3, Columns 5–8). This implies that households are most capable of obtaining temporary discounts for goods that they regularly buy throughout the benefit month and that these discounts are mostly obtained at the beginning of the benefit month.

C. Robustness Checks

Can our results be driven by retailers systematically discounting food at the beginning of SNAP months? Previous research using data from Nevada, which issues benefits on a single day each month, found that retailers tend to *increase,* rather than decrease, prices at the beginning of SNAP benefit months (Hastings and Washington 2010). Such behavior would make it even more challenging for SNAP households to obtain goods at cheaper prices at the beginning of the benefit month. Most states no longer distribute SNAP on a single day, but instead pay SNAP benefits over a wider range of days across the calendar month (USDA Economic Research Service 2019). Potentially as a result, researchers now find less evidence for retailers varying prices according to state benefit issuance schedules (Goldin, Homonoff, and Meckel 2020).

In our setting, systematic retailer pricing does not drive our results in either of our analysis approaches. The UPC-based price index at-time-of-purchase approach effectively neutralizes such a possibility, because the UPC-based price index is constructed by dividing the actual price of a good purchased by a household in a given week by the average price of that good from stores in the local area in the same week of purchase. All calendar-specific week price movements will hence be captured in this average price.[15]

For our price-index-through-time approach, we test for the influence of systematic retailer pricing in two ways, as shown in Table 4. First, we directly document the price of the weekly Thrifty Food Plan baskets in the stores frequented by our households, weighted by household expenditures at each store one, two, or three weeks after purchase. We find that stores visited at the beginning of the SNAP month do not generally increase price levels two to three weeks later (Column 1). Furthermore, when we include these Thrifty Food Plan basket prices as controls (not shown), all estimates remain virtually unchanged in terms of magnitudes and significance. The fact that the price of the Thrifty Food Plan at visited stores does not change across the benefit month demonstrates that households must engage in more than passive shopping in order to obtain goods at temporary discounts systematically at the beginning of the benefit month. It also suggests that they do not persist in that level of shopping effort towards the end of the benefit month.

Second, we examine the proclivity of households that do not participate in SNAP to purchase goods at temporary discounts depending on when they are surveyed in the benefit month. In lieu of a SNAP benefit date for non-SNAP households, we split

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15. The inclusion of calendar-week-of-first-survey-day controls in this analysis leads to slightly more significant estimates (not shown).

Table 4
Prices of Purchased Goods in Subsequent Weeks

| | Thrifty Food Plan Index | | SNAP Households in States with Compressed Benefit Distribution Schedules | | Non-SNAP Households: <185% Poverty Guideline in States with Compressed Benefit Distribution Schedules | | Non-SNAP Households: >185% Poverty Guideline in States with Compressed Benefit Distribution Schedules | |
| | Purchased First Half of SNAP Month | Purchased Second Half of SNAP Month | Surveyed within Benefit Distribution Dates | Surveyed outside of Benefit Distribution Dates | Surveyed within Benefit Distribution Dates | Surveyed outside of Benefit Distribution Dates | Surveyed within Benefit Distribution Dates | Surveyed outside of Benefit Distribution Dates |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$t+1$ week	0.002	0.007	−0.005	−0.023**	0.004	−0.011	−0.024***	−0.019**
	(0.004)	(0.006)	(0.006)	(0.008)	(0.010)	(0.009)	(0.006)	(0.008)
$t+2$ weeks	0.001	0.002	0.016	0.005	0.029**	0.012**	−0.006	−0.003
	(0.003)	(0.004)	(0.011)	(0.010)	(0.013)	(0.004)	(0.007)	(0.007)
$t+3$ weeks	−0.003	0.008*	0.024**	0.008	0.019	0.020**	0.006	0.005
	(0.004)	(0.004)	(0.011)	(0.013)	(0.017)	(0.008)	(0.009)	(0.006)
Observations	1,732	2,052	676	788	468	720	980	1,324

Source: Authors' estimates using FoodAPS data and the FoodAPS IRI subset.
Notes: Authors' calculations using data from the National Food Acquisition and Purchase Survey, the IRI FoodAPS subset, and data from the SNAP Distribution Schedule Database (https://www.ers.usda.gov/data-products/snap-policy-data-sets/, accessed November 15, 2022). Survey weights applied in estimation and standard errors (in parentheses) adjust for complex survey design. Significance: $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received. States with compressed SNAP benefit distribution schedules are defined as states that distribute all SNAP benefits within ten or fewer consecutive days in the month. Within Benefit Distribution Dates = at least one survey day occurs within the state benefit distribution window.

households by whether they have at least one survey day occurring within the state benefit distribution window and limit our analysis to households who live in states that have compressed SNAP benefit distribution schedules, defined as states that distribute all SNAP benefits within ten or fewer consecutive days in the month. Results are presented for SNAP households, low-income non-SNAP households, and higher-income non-SNAP households (Columns 3–8). We see that SNAP households (Table 4, Columns 3–4) demonstrate almost identical patterns as when their actual distribution date is used (Table 3, Columns 1–2). That is, SNAP households are more inclined to buy goods at a discount inside, rather than outside, the benefit disbursement window. If stores systematically lower price levels inside the SNAP distribution window, then we should similarly see larger inclinations to buy discounted goods inside rather than outside the distribution window among non-SNAP households. Instead, we find that low-income non-SNAP households are inclined to buy goods at a discount both inside and outside the benefit disbursement window (Table 4, Columns 5–6).[16] Higher-income non-SNAP households are not inclined to buy goods at a discount either inside or outside the benefit disbursement window (Table 4, Columns 7–8). These findings provide further evidence that stores do not systematically lower price levels inside the SNAP benefit distribution window.

IV. Shopping Efforts across the Benefit Month

With no evidence that stores systematically lower price levels at the beginning of SNAP months, we next investigate if instead households themselves engage in greater levels of shopping effort that allow them to buy goods at lower prices towards the beginning of the SNAP month. We especially want to investigate shopping efforts that may be dependent on the availability of liquidity, such as cherry-picking, volume discounts, and stockpiling.

Cherry-picking refers to purchasing a desired good from the cheapest retailer (or at the cheapest time) rather than making all purchases from one store (or at one time) (Fox and Hoch 2005). Cherry-picking consumers will make additional store visits if the total value of savings from these extra visits exceeds the transaction costs incurred by the additional visits. This behavior may require that consumers have the ability to make large enough purchases at these additional stores in order to produce the savings that justify the trip. Previous research has found that frequency of store visits can explain a significant portion of price differences of foods acquired by different households (Aguiar and Hurst 2007) and that significant opportunities for savings exist by cherry-picking across even just two stores (Fox and Hoch 2005).

Volume discounts include quantity promotions (for example, buy two get one free, three for $5) and bulk discounts in which larger package sizes are sold at lower per-unit prices. Stockpiling occurs when consumers purchase a larger volume of goods in response to temporarily lower prices with the intent to consume the goods in the future,

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16. Recall that low-income non-SNAP households are composed in large part of seniors whose income comes largely from monthly retirement pay. Monthly retirement pay, such as Social Security, is disbursed throughout the month. Hence, it is possible that Social Security households, like SNAP households, are more inclined to buy goods at a discount soon after receipt of monthly pay.

incurring an inventory cost (Hendel and Nevo 2006). As with cherry-picking, volume-purchasing and stockpiling require consumers to have enough funds on hand.

A. Proxies for Shopping Efforts

We construct various proxies for shopping efforts that can be used for analyzing how efforts change across the benefit month.

1. Volume indexes

Some of the price-saving techniques previously mentioned (that is, quantity promotions, bulk-size discounts, stockpiling) entail purchasing goods in high volumes. Hence, we require a measure that captures households buying goods in high volumes either by buying large quantities of the same good or by buying goods in large sizes. We create two volume indexes, following somewhat similar procedures as those used to create the price indexes. First, for each food category included in a household's price index, we take the ratio of the total volume (in grams) of goods purchased in that food category over the seven-day survey and the corresponding average volume of goods purchased in that food category by households in the same PSU in the same month. We then take the median ratio among the food categories purchased by a household and assign this value as the value of the volume index for this household.[17] Again, we normalize the volume index by dividing by the average volume index of all households within the same PSU. We repeat this procedure to create another volume index using the average volume purchased per food category per trip instead of total volume per food category over the seven survey days. Volume index values greater than one imply that households buy larger volumes of goods (per trip or over seven days) than the average household does, and volume index values less than one imply that households buy smaller volumes of goods than the average household does.

2. Cherry-picking

We use a number of measures to proxy for cherry-picking. These include the number of shopping events that occur in the survey period, the number of unique stores visited in the survey period, the average number of visits per store over the survey period, and the number of days that at least one shopping event occurred. These proxies are indirect measures, and their increase is consistent with cherry-picking behavior.

3. Bulk purchases

We use the IRI store transaction data to create several variables relating to bulk purchases. We strip package size information from item descriptions in the IRI product dictionary and then identify all barcodes that have the same basic product description. We group these like items into larger USDA Economic Research Service (ERS) food

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17. Instead of taking the median ratio we can also take the weighted average ratio by expenditures. We arrive at similar conclusions in our analysis using either measure and prefer to use the median in order to avoid including any prices in the creation of volume indexes.

groups.[18] Following Griffith et al. (2009) and Nevo and Wong (2019), we determine the 60th percentile of package sizes out of unique package sizes within each ERS food group to use as the cutoff for determining bulk package sizes. We create two household-level variables to measure the extent of bulk purchases: percent of items bought that are above this size cutoff and percent of expenditures on items that are above this size cutoff.

4. Explicitly documented discounts

Though we capture the inclination of households to purchase goods at temporary discounts in the exercise in Section III.B, we also document any discounts captured on store receipts. This includes the dollar amount of item-level savings printed on the receipt, the ratio of item-level savings and total receipt expenditures, and any coupon use observed on any receipt.

B. Analysis of Shopping Efforts across the Benefit Month

Table 5 compares the average value of the price-reducing shopping proxies by when they occur in the SNAP month. At the beginning of the benefit month, SNAP households buy goods within the same food category in higher volumes than they do toward the end of their benefit month. Buying first in higher volumes and then subsequently buying in lower volumes later in the benefit month may indicate stockpiling behavior or greater responsiveness to volume discounts at the beginning of the benefit month. Interestingly, we see that SNAP households do not generally engage in more food acquisition events, more unique store visits, more visits per store, or more days to acquire food across the SNAP month. Rather, they vary which types of stores they acquire food from across the benefit month. Specifically, SNAP households make more large-volume store visits at the beginning of the benefit month than towards the end of the benefit month. And they visit more unique large-volume stores and make more visits per large-volume store at the beginning of the benefit month. Large-volume stores may offer more opportunities to purchase goods at lower prices than other types of food stores.

A higher frequency of large-volume store visits allows for greater opportunity to cherry-pick food items as the set of prices that households face grows. Indeed, we saw greater inclination of purchasing goods at discounts in the exercise in Section III.B. We see some signs of this on receipts as households tally a greater dollar amount of item-level savings listed on receipts at the beginning of the SNAP month (though there is no significant difference as a ratio of total spending). Furthermore, households are more likely to use coupons at the beginning of the SNAP month than towards the end of it.

We do not find that the share of items or expenditures from bulk purchases is higher at the beginning of the SNAP month relative to the end of the SNAP month. This suggests that the relatively higher volumes of goods obtained at the beginning of benefit month are due to the purchasing of greater quantities of the same goods rather than the purchasing of goods in larger sizes.[19]

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18. We identify the ERS food group associated with each set of items by matching the IRI barcodes to barcoded items in FoodAPS that have an ERS food group assigned. See Online Appendix B for greater details on USDA food codes, food groups, and food categories.

19. This is not to say that SNAP households do not engage in bulk-size purchases as a significant source of price savings.

Table 5
Proxies for Shopping Effort across the Benefit Month

	First Half of SNAP Month	Second Half of SNAP Month	Difference	N
Seven-day volume index	1.07	0.94	0.13*** (0.03)	1,304
Event volume index	1.06	0.95	0.10*** (0.02)	1,304
Total food-at-home and food-away-from-home events	11.49	11.06	0.43 (0.77)	1,304
Total food-at-home trips	4.03	4.02	0.01 (0.19)	1,304
Total food-at-home trips excluding free events	3.80	3.61	0.19 (0.18)	1,304
Total large-volume stores trips excluding free events	2.75	2.33	0.42*** (0.13)	1,304
Conditional visits per store—food-at-home events	1.63	1.58	0.05 (0.06)	1304
Conditional visits per store—not-free food-at-home events	1.66	1.56	0.10 (0.07)	1,303
Conditional visits per store—not-free large-volume stores	1.69	1.58	0.11* (0.06)	1,217
Number of unique stores—food-at-home events	2.66	2.69	−0.03 (0.15)	1,304
Number of unique stores—not-free food-at-home events	2.46	2.43	0.03 (0.13)	1,303
Number of unique stores—not-free large-volume stores	1.79	1.65	0.14** (0.07)	1,217
Number of days with at least one food-at-home event	2.92	2.89	0.03 (0.10)	1,304
Number of days with at least one not-free food-at-home event	2.79	2.65	0.14 (0.10)	1,304
Number of days with at least one not-free large-volume stores event	2.18	1.89	0.29** (0.11)	1,304
Receipt savings	1.61	0.96	0.65** (0.30)	1,304

(*continued*)

Table 5 (*continued*)

	First Half of SNAP Month	Second Half of SNAP Month	Difference	N
Percent savings of receipt total	0.01	0.01	−0.00 (0.00)	1,304
Observed coupon use (transaction or item level) on receipt	0.23	0.13	0.10** (0.04)	1,304
Share of all expenditures on large items	0.39	0.39	−0.00 (0.02)	1,273
Share of all items purchased that were in large packages	0.29	0.32	−0.03* (0.02)	1,282

Source: Authors' estimates using FoodAPS data and the FoodAPS IRI subset.
Notes: Survey weights applied in estimation and standard errors (in parentheses) adjust for complex survey design.
Significance: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received.

Even if households do not have a tendency to buy more bulk-sized items at the beginning of the benefit month than towards the end of it, it still could be that bulk-sized items that are bought at the beginning of the benefit month provide deeper savings than those bought towards the end of the benefit month. We create variables that measure how much more households would spend if they exchange larger packages for smaller sizes, holding quantities constant. In other words, how much more would they spend if they face the higher unit prices associated with smaller package sizes. To do this, we use the barcode item sets derived from the IRI product dictionary described in Section IV.A.3 to determine the largest, median, and smallest package sizes of each item available at the FoodAPS household's store of purchase. We then calculate the unit prices for each package size in the same week in which the household purchases their item.[20] To determine the additional cost of purchasing smaller packages we multiply the total ounces purchased by the unit price of the smallest and median packages, sum over all items that are identified in IRI, and subtract actual cost spent on these items. The share of additional spending is computed by dividing the additional cost by the actual total cost of purchasing the items.[21]

20. Not all stores that are visited by FoodAPS households appear in IRI, and not all chains in the IRI data provide store-level transaction data. For chains that provide item-level transactions aggregated to a market area, we determine the package size ranges and unit prices for that chain in the market area where the household resides. For all other items (where the exact store or chain is not in the IRI data), we consider items sold at all stores in the same secondary sampling unit (SSU, generally a census block group) that week, or PSU when there are no observations within the SSU in that week.
21. Any items that were actually purchased in the smallest or median package sizes are included in the total spending calculation (the denominator), but their additional cost is zero. In other words, these items do not contribute to the numerator.

Table 6
Bulk Savings

	Items Purchased in First Half of SNAP Month	Items Purchased in Second Half of SNAP Month
Mean percent cost increase for replacing relatively larger items with smallest sizes	10.2%	11.1%
Mean percent cost increase for replacing relatively larger items with median sizes	5.1%	6.0%
Mean percent cost increase for replacing only largest sizes with smallest sizes	5.3%	5.2%
Mean percent cost increase for replacing only largest sizes with median sizes	3.0%	3.9%
Observations	364	419

Source: Authors' estimates using FoodAPS data and the FoodAPS IRI subset.
Notes: Survey weights applied in estimation of means to adjust for complex survey design. First Half of SNAP Month = at least one survey day occurs less than seven days since SNAP was last received.

In Table 6, we list the average percent change in the price of a basket of goods if a listed size substitution is made. We find that substituting the unit price of smaller package sizes for unit prices of the larger packages actually purchased can increase the price of a household's basket of goods by 3–11 percent. However, we do not see that these bulk-size price savings are any greater for purchases made in the first half of the benefit month than those made in the second half of the benefit month. Hence, the benefit month price savings patterns do not seem to be driven by bulk purchases. Rather, we find necessary evidence that benefit month price savings is driven by the channels of cherry-picking, stockpiling, quantity promotions, or coupon use.

V. Discussion and Conclusion

We find that SNAP households purchase food at lower prices at the beginning of the benefit month relative to the end of it. We confirm that this is not driven by systematic patterns in store pricing. Rather, households increase their shopping efforts upon lump-sum benefit receipt. Our findings are inconsistent with a theory that households misperceive the permanence of being "flush" since such a bias should cause households to be less price conscious when they have more money on hand. In a similar vein, these results raise questions about theories that SNAP households treat SNAP benefits as earmarked for mental accounts specific to food shopping (Hastings and Shapiro 2018; Smith et al. 2016). In these theories, households perceive $1 saved on food to be less valuable than a $1 saved on nonfood items, leading to reduced shopping effort out of SNAP funds (Hastings and Shapiro 2018). We find the opposite—SNAP households engage in greater shopping efforts and appear to be more price conscious when they are spending greater amounts out of SNAP funds (Online Appendix Figure 2).

This finding is robust across different measurement approaches and is consistent with recent work by Goldin, Homonoff, and Meckel (2020), who use weekly store sales data and find evidence that consumer price elasticity is slightly greater at the beginning of the SNAP benefit month than towards the end of it.

What can explain households simultaneously consuming food impatiently across the benefit month and aggressively engaging in price-saving shopping efforts early in the benefit month? We conjecture that the timing of income distribution can both spur on impatient consumption and the ability to attain high returns on shopping effort. This can occur if households are present-biased and if infrequent income distribution itself effectively acts as a savings commitment device that funds price-saving shopping efforts that require access to lump sums of liquidity. The concept of infrequent lump-sum pay acting as a savings commitment device is explored most convincingly in a field experiment by Casaburi and Macchiavello (2019). In this experiment, Kenyan dairy farmers are willing to accept lower prices for their goods if they received payments on a monthly basis rather than on a daily basis. That is, farmers are willing to pay for a mechanism that can help them convert small daily earnings into a large monthly lump sum because they are aware that they lack the ability to do so themselves, potentially due to present bias. Lump-sum pay is helpful when consumers need to cover large lumpy expenses (for example, rent, utility bills) or make investments in durable goods. For example, Goodman-Bacon and McGranahan (2008) and Adams, Einav, and Levin (2009) find that low-income households increase purchases of vehicles during the time of the year that they receive lump-sum tax refunds. In the SNAP setting, infrequent SNAP benefits can enable households to engage in specific shopping efforts that would not have produced as much of a price-saving return without access to lump sums of liquidity. However, once food is purchased, present-biased preferences can still cause households to consume in an unsmooth fashion.

A trade-off hence emerges for present-biased consumers. Large but infrequent payouts can be used as a mechanism to regulate savings, while small but frequent payouts can be used as a mechanism to regulate consumption.[22] Researchers and policymakers have suggested splitting monthly payments into smaller more frequent payments in response to the consistent findings of unsmooth consumption in pay cycles (Shapiro 2005; Eggert 2008; Parsons and Van Wesep 2013). Advocates in the food assistance settings commonly provide pushback to this recommendation (USDA Food and Nutrition Service 2016; Eggert 2008). The few surveys of SNAP households that exist on the topic generally find a preference for monthly benefit issuance over more frequent issuances. For example, the Michigan Department of Human Services (DHS) surveyed 1,037 Food Stamp recipients at local DHS offices in March of 2008 in response to proposed legislation to increase the frequency of benefit distribution and found that 59 percent preferred to receive benefits once per month rather than twice per month, while 35 percent preferred receiving benefits twice per month (Eggert 2008). Of the 31 Food Stamp recipients surveyed in Gorczycki (2014), only 6.4 percent thought a twice-per-month benefit issuance would have a positive effect on themselves, while 35.5 percent predicted it would have a negative effect. Hence, advocate objections and available survey responses imply that SNAP households do

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22. Greater exploration of the implications of pay frequency as well as legal regulations of pay frequency as commitment devices can be found in Parsons and Van Wesep (2013).

value the infrequency of benefit pay and that they value this infrequency as a savings commitment device more highly than they do pay frequency as a consumption smoothing device.[23]

Our results provide some proof that SNAP households utilize the infrequency of benefit receipt productively by engaging in price-saving efforts. Future research is needed to determine optimal pay frequencies that balance trade-offs between savings and consumption smoothing. Alternatively, research can also focus on other mechanisms that can regulate day-to-day consumption smoothing outside of the channel of pay frequency.

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23. Using the same approach as in Shapiro (2005), we estimate that the gains from perfectly smoothing $500 worth of food spending rather than consuming 0.4 percent fewer calories every day as observed in Shapiro (2005) ranges from $0.30 and $1.50 a month. The range occurs by varying the coefficient of relative risk aversion used in Shapiro (2005) from one to five, the upper range typically used in consumption literature (see Laibson, Repetto, and Tobacman, 2003). These dollar values estimate how much wealth a SNAP household is willing to give up to consume the same calories every day of their SNAP month, rather than consume 0.4 percent fewer calories every day. For households to prefer less frequent benefit pay, it must give them returns from savings that are greater than these dollar amounts.

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