Is there an Nth of the Month Effect? The Timing of SNAP Issuance, Food Expenditures, and Grocery Prices

Jacob Goldin Tatiana Homonoff Katherine Meckel*

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Abstract

Previous research on the Supplemental Nutrition Assistance Program (SNAP) suggests that participants consume more food on days immediately following benefit issuance, prompting retailers to raise food prices to capture a portion of the transfer. Partly in response to such findings, some have called for states to stagger benefit issuance over multiple days of the month. To study the effect of staggering benefits, we link variation among states in the timing of benefit issuance to a large panel of transaction-level data from households and retailers. We document large intra-month cycles in food expenditures among SNAP-eligible households that closely track state issuance policies. However, we rule out economically significant effects on retailer pricing, which suggests that staggering benefits would not meaningfully shape the incidence of SNAP benefits.

Introduction

The Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamps Program, is the largest nutrition assistance program in the United States, providing benefits to

over 46 million households at an annual cost of almost $75 billion. Once per month, each SNAP participant is issued a lump sum allocation of benefits that can be redeemed for food at grocery stores or other retailers. Standard economic theory predicts that SNAP participants, who must be low income in order to qualify for the program, would ration their benefits throughout the month in order to smooth consumption and avoid having to skip a meal. However, if participants are present-biased they may consume too much at the beginning of the benefits cycle, leaving themselves unable to afford enough food at the month's end (Wilde and Ranney, 2000; Shapiro, 2005; Hastings and Washington, 2010). Recognizing this tendency, retailers may strategically raise food prices in low-income neighborhoods in the days following SNAP issuance to take advantage of SNAP-induced cycles of demand (Hastings and Washington, 2010).

Partly on the basis of such findings, policymakers have called for states to revamp their SNAP programs so that participants receive benefits on different days from one another. There are two common rationales for such reforms. First, staggering issuance could reduce hassles for consumers and retailers caused by too many customers shopping at the same time (USDA, 2012). Second, staggering issuance could shift the incidence of the benefit from retailers to consumers. That is, if SNAP participants receive their benefits on different days in the month, retailers will be unable to capture the program's surplus by raising prices during periods of predictably high food demand. For either of these benefits to materialize, however, it must be that SNAP issuance is what causes the fluctuations that others have observed in food expenditures and retailer prices.

In this paper, we study whether the timing of SNAP issuance affects demand for food among SNAP recipients and, in turn, the pricing decisions of retailers. We do so by taking advantage of the substantial variation that exists in SNAP issuance policies by state. For example, in Nevada all SNAP participants receive their benefits on the first of the month, whereas in Missouri the day on which SNAP participants receive their benefits varies by person – a Missourian's issuance day may fall anywhere between the first and the 22nd of the month. We exploit cross-sectional variation in state policy as well as variation in policy across time to identify whether cyclicality in consumption and pricing are due to the timing of SNAP issuance. Understanding the source of cyclicality in these variables is crucial for evaluating the desirability of staggering the timing of

SNAP issuance.

To study such policies, our analysis utilizes a large panel of consumption and transaction-level retail data drawn from all 48 contiguous states and Washington, D.C – many of which vary with respect to their SNAP issuance policies. The data contains daily expenditure data on food and non-food purchases for over 75,000 households as well as scanner data on weekly volume and price information from over 10,000 grocery stores. The richness of this data allows us to overcome important limitations that have characterized prior research to identify the impact of SNAP issuance staggering on both consumer and retailer responses.[1] Importantly, this data allows us to determine whether pricing patterns are representative of an industry (rather than a single chain) and to determine if observed intramonth cyclicality in food expenditure and pricing stem from the timing of SNAP issuance or from other monthly patterns such as employee pay schedules, other benefit programs, or due dates for rent or utility bills.[2]

To begin, we investigate food expenditure cyclicality among SNAP-eligible households. We use daily household expenditure data from the Kilts-Nielsen Consumer Panel from 2004 to 2011. We document a substantial "first of the month" effect: among SNAP-eligible households living in states that issue all SNAP benefits on the first day of the calendar month, food expenditures are 27 percent higher in the month's first week than in its fourth week relative to SNAP-ineligible households. However, we also observe a similar pattern for expenditures on non-food items that are not covered by SNAP, raising the possibility that the observed cyclicality is being driven by factors other than the timing of SNAP issuance.

To investigate, we take advantage of our multi-state data set to expand the analysis to states with alternative SNAP issuance policies. We find that food expenditure among SNAP-eligible households is tied closely to the state's SNAP issuance policy: food expenditures among SNAP

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[1]Earlier studies that rely on consumption surveys (Wilde and Ranney, 2000; Shapiro, 2005) or administrative data on SNAP redemptions (Castner and Henke, 2011; Cole and Lee, 2005), though nationally representative, lack detailed food pricing data so are unable to measure retailer responses. Hastings and Washington (2010), the study closest to our own, uses houshold-level panel data on both food expenditure and price at the product level which offers several important advantages. However, the data only contains information from three stores, all drawn from a single state and a single chain. Because all SNAP participants in that state receive their benefits on the first of the month, the authors cannot investigate the impact of SNAP issuance staggering.

[2]Previous research finds evidence that expenditures are highest shortly after receiving a paycheck (Stephens Jr., 2006), pension benefits (Stephens Jr. and Unayama, 2011), and Social Security benefits (Stephens Jr., 2003; Mastrobuoni and Weinberg, 2009, 2010).

participants are cyclical in states that issue all SNAP benefits at the beginning of the month, but relatively constant in states that stagger issuance over the month. In contrast, we find no such pattern for non-food expenditures, suggesting that the observed cyclicality in that variable is driven by factors other than SNAP issuance. We complement this analysis by studying within-state changes in Illinois's SNAP issuance policy, drawing on administrative data on SNAP redemptions. Here too we find that patterns in SNAP redemption closely track changes in the timing of SNAP issuance. The results of these analyses provide strong support that a state's SNAP issuance policy shapes the timing of food expenditures by SNAP-eligible households.

Next, we turn to the effect of SNAP issuance timing on retailer pricing decisions. Previous research suggests that when states issue all SNAP benefits on the first of the month, retailers in low-income neighborhoods raise food prices at the beginning of the month to take advantage of the surge in food demand among SNAP-eligible households.[3] If so, staggering the timing of SNAP issuance across participants could be an effective way to shape the incidence of the benefit – i.e., to ensure that transfers intended for SNAP participants are not captured by retailers.

To investigate this phenomenon, we utilize data from the Kilts-Nielsen Retailer data set, which contains weekly product-level price and expenditure data by store for approximately 53 percent of supermarket food purchases in the United States between 2006 and 2012. Using this data, we study the effect of state issuance policy on monthly cyclicality in food prices. In contrast to the previous literature, we find that the timing of SNAP issuance has no effect on the cyclicality of food prices. Our null effect is precisely estimated – a 95% confidence interval excludes price increases greater than 0.2 percent in the week that benefits are issued.

Finally, we explore several potential explanations for why retailers do not adjust prices in response to predictable cycles in consumer demand for food. We find some support for the theory that retailers are constrained by the presence of non-SNAP households and some for the theory that retailer price responses are constrained by the presence of nearby competitors. However, even in areas with high SNAP prevalence and low market concentration, we can reject that prices are

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[3]The pricing effects identified by Hastings and Washington (2010) are modest in magnitude but economically significant in the aggregate. Specifically, they conclude retailer pricing effects cost SNAP participants an average of $3.50 per month, or $42 per year. Scaling this figure by the approximately 45 million individuals who participated in SNAP in 2015 suggests the aggregate amount at stake is about $1.9 billion.

at more than 0.5 percent higher in benefit delivery weeks than in other weeks. This suggests that while staggering SNAP issuance days over the course of the month is likely to reduce complications associated with surges in customer traffic, such as long lines or difficulty stocking shelves or staffing stores, the policy is unlikely to impact the incidence of the program.

The paper is structured as follows. Section I reviews state policies on the timing of SNAP issuance. Section II describes our data. Section III investigates the effect of SNAP issuance policy on household expenditures. Section IV investigates the effect of issuance policy on food prices. Section V concludes.

I. SNAP Issuance Policies

In each state, households participating in SNAP receive their monthly allotment of benefits on a single day each month. In some states, each participating household receives their benefits on the same day as every other participating household. States that issue all SNAP benefits on a single day mostly do so on the first of the month. In contrast, other states stagger benefit issuance over multiple days – e.g., some households may receive their monthly benefits on the first, some on the third, and some on the fifth day of the month. Among states that stagger benefit issuance, there exists considerable variation in the number of days on which benefits are issued. For example, Wyoming staggers its benefit issuance across the first four days of the month, whereas Missouri issues benefits between the first and 22nd days of the month.

Table 1 provides a summary of the SNAP issuance policies from 2004 to 2012. The table highlights that in recent years, the trend among states has been to switch from issuing all benefits on a single day to staggering benefit issuance over the course of multiple days. By the end of 2012, 65 percent of states staggered the issuance of SNAP benefits over a period of at least 10 days and 20 percent of states over a span of 15 days or more. For more detailed information on SNAP issuance policies by states, see Appendix Table A.

There are two main rationales for why a state might choose to begin issuing SNAP benefits to different individuals on different days over the course of the month. First, if the timing of SNAP issuance affects the timing of food expenditures, staggering issuance can reduce hassles for both

consumers and retailers caused by so many people wanting to buy food at the same time. For example, the United States Department of Agriculture, which administers SNAP, recommended in 2012 that states stagger the days on which SNAP benefits are issued to reduce the "strain on SNAP clients and on participating retailers [from] surges in customer traffic at SNAP authorized stores." In addition, a second rationale for staggering SNAP issuance is to shift the incidence of the benefit from retailers to consumers. That is, if SNAP participants receive their benefits on different days in the month, retailers will be unable to capture the benefits of the program by raising food prices during periods of peak food demand.

For either of these benefits to materialize, however, it must be that SNAP issuance is what causes the fluctuations that others have observed in food expenditures and retailer prices. The remainder of the paper address how much, if any, of the monthly cyclicality in these variables is driven by the timing of SNAP issuance.

II. Data

Our data comes from two data sets collected by the Kilts-Nielsen center, which we supplement with administrative data from Illinois. The Kilts-Nielsen data offers many of the same benefits as the data employed by Hastings and Washington (2010), such as a large panel of households over multiple years, as well as detailed price and expenditure data at the UPC level. However, an important advantage of our data is that it contains a large number of stores from across the United States and operated by multiple chains. This feature of our data allows us to exploit variation in SNAP issuance policies across states and over time. Below is a detailed description of the data.

A. Household Expenditure Data

Our data on household expenditures comes from the Kilts-Nielsen Consumer Panel. This data set includes 40,000 to 60,000 households each year from 2004 to 2013. Households are recruited through the mail and internet and are rewarded with monthly prize drawings and gift points in return for their participation. The selection process is designed to recruit a sample that is demographically representative at the national level and within individual markets. In-home optical

scanners allow participants to record the exact product information of purchases by scanning the product's Universal Product Code (UPC). Each observation in the data includes household expenditures by product (defined at the UPC-level), store, and date. All households remain in the data for at least one year and the majority remain for longer. Nielsen reports an annual retention rate of about 80 percent.

The data contains demographic information on household income, family size, marital status, and state, county and ZIP code of residence, along with several other demographic variables. We proxy for SNAP participation using a household's SNAP eligibility, which we calculate based on income and household size.[4] We observe household income information with a two year lag; hence we restrict our sample to years between 2004 and 2011.

Panel A of Table 2 presents summary statistics for our sample. We observe 78,480 households who participate in the sample for an average of four years each, yielding a total of 298,704 household-year observations. We estimate that 13 percent of households are eligible for SNAP per year.

Table 2 also presents additional descriptive statistics by SNAP eligibility. By construction, SNAP-eligible households report significantly lower incomes than the rest of the sample – SNAP-eligible households have an average income of \$12,372 compared to \$63,799 for ineligible households. While SNAP-eligible households are much less likely to be married than ineligible households (25.0 vs 49.1 percent, respectively), the two groups have a similar racial composition (27.3 percent of SNAP-eligible households identify as non-white compared to 25.5 percent in ineligible households) and both groups have an average of one child in the household. Additionally, our sample is much older and more educated than the United States as a whole in addition to having extremely low unemployment rates. SNAP households report spending \$32.54 per week on food, whereas non-SNAP households report spending \$35.88.[5]

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[4]Household income is reported in sixteen income ranges. We assign each household an income level equal to the midpoint of the indicated range.

To be eligible for SNAP, a household's total income must be less than 130 percent of the Federal Poverty Line, which varies with household size. Additionally, SNAP eligibility requires a household's net income (total income minus a set of SNAP-defined deductions) not exceed 100% of the federal poverty line. Due to data limitations, our eligibility measure uses the restrictions on total income only.

[5]Nielsen estimates that participating households report approximately 30 percent of their total consumption. Using this estimate, average total weekly expenditures on food should be about \$108. This estimate is similar to the

B. Retailer Price Data

To study the effect of issuance policy on retailer pricing, we utilize the Kilts-Nielsen Retail Scanner data set. The data contains point of sale records from approximately 35,000 retail stores in the United States for the 48 contiguous states between 2006 to 2012, capturing 53 percent of food sales nationwide during this time period. When a cashier scans the purchased product's bar code, an Electronic Cash Register (ECR) records the product's UPC and assigns the price. After the customer pays, data from the sale is saved by the ECR. Although stores may change their prices at the daily level, Nielsen receives pricing data at the weekly level, with the sales week ending on a Saturday.[6] For a given product, the price that we observe is equal to the volume-weighted average price for sales during the days covered in the reference week. Nielsen does not receive price data for UPCs that were not sold in a given store and week. Each observation in the data includes the number of units sold and the average price of each UPC sold by store and week.

In addition to price and quantity, the data contains information on several store characteristics including retail chain, parent company, and retail channel (grocery, drug, mass merchandiser, convenience or liquor store) identifiers. Since the majority of SNAP redemptions occur in grocery stores, we restrict our pricing analysis to the 10,070 retailers in that category. Panel B of Table 2 presents summary statistics for this sample. The majority of these stores are large retailers and we find an average annual food sales volume of almost 8 million dollars per store. The data includes county-level geographic information for each store, we also impute store zip code each store based on the residence of shoppers at that store in the Consumer Panel.[7] We link these geographic identifiers to estimates of SNAP participation from the Food and Nutrition Services Department at the USDA and measures of grocery store accessibility from the USDA's Food Access Research

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USDA's measure of weekly food expenditures among low- to moderate-cost meal plans for two-person households. See http://www.cnpp.usda.gov/sites/default/files/CostofFoodMar2015.pdf.

[6]All stores report price and volume data for a seven-day period, but this period may not end on a Saturday; for example, stores may submit data that aligns with their promotion week instead. Rather than including the exact dates used by each retailer, Nielsen assigns the data to the "best fit Saturday," e.g., the Saturday that most closely matches the promotion week. Since no information is provided on the actual date range for the weekly data by retailer, we use the given week-ending data.

[7]The Consumer Panel data contains information on each household 5-digit zip code of residence as well as the store identifier for any shopping trips the household makes. If households from multiple zip codes make purchases at a given store, we assign the store the most frequent zip code. We are able to impute zip code for roughly two thirds of our sample.

Atlas. The stores in our sample are located in zip codes in which 10 percent of residents are SNAP participants and 6 percent of residents are have limited access to grocery stores in addition to living in a low-income area.[8]

C. Administrative Data on SNAP Issuance and Redemption in Illinois

Our third source of data comes from the Illinois Department of Human Services. This data set contains information on the number of households that were issued SNAP benefits as well as the dollar amount of SNAP benefits that were redeemed, for each day between January 2008 and August 2014. During this time period, Illinois provided SNAP benefits to an average of over 750,000 households each month. We utilize this data to study the effect of changes in the SNAP issuance policy in Illinois, which changed three times during the period covered by our data.

III. SNAP Benefit Timing and Consumer Expenditures

This section investigates the link between the timing of SNAP benefit issuance and monthly expenditure patterns using the Nielsen Consumer Panel data.

A. Expenditures in "First of the Month" Issuance States

This section explores within-month expenditure patterns in states that issue SNAP benefits to all participating households on the first day of each month. Eight states in our data fall into this category. The analysis in this section is similar to that in Hastings and Washington (2010). However, we build on their results by utilizing data from significantly more stores (1,211 versus 3), more retailer chains (41 versus 1), and more states (8 versus 1), raising the likelihood that our results will capture typical consumer behavior in the states that follow a first of the month issuance policy.

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[8]In the Food Access Research Atlas, households are classified as low-access if they live more than one mile away from the nearest supermarket in urban areas or more than ten miles away in rural areas. Additionally, households are classified as low-income if their census tract of residence as a poverty rate is 20 percent or greater, median family income is less than or equal to 80 percent of the State-wide median family income, or the tract is in a metropolitan area and has a median family income less than or equal to 80 percent of the metropolitan area's median family income.

i. Food Expenditure

Since SNAP benefits can only be used to purchase food, we begin our analysis by restricting our focus to expenditures on SNAP-eligible items since expenditures on these products are most likely to be affected by SNAP issuance date.[9] Before turning to the regression analysis, Figure 1 plots average daily expenditures for SNAP-eligible and ineligible households over the course of the month.[10] The figure highlights a dramatic spike in food expenditures at the beginning of the calendar month, along with a gradual decline as the month progresses among SNAP-eligible households, but constant food expenditures among SNAP-ineligible households.

The regression analysis uses the following econometric model to compare food expenditures across the first four weeks of the calendar month for SNAP-eligible and ineligible households:

$$Y_{iwmy} = \sum_{w=2}^{4} [\alpha_w week_w + \beta_w SNAP_{iy} * week_w] + \gamma SNAP_{iy} + \delta_m + \eta_y + \theta_i \tag{1}$$

where Y_{iwmy} is a measure of food expenditure for household i in week w of month m and year y, $SNAP_{iy}$ is an indicator variable for whether a household is eligible for SNAP in a given panel year, $week_w$ indicates the week of the month for $w\epsilon\{2,3,4\}$, and δ_m, η_y , and θ_i are month, year, and household fixed effects, respectively. All regressions include population weights and standard errors are clustered at the household level. In this regression, α_w measures the change in food expenditure within a household between the first and the wth week of the calendar month for households that are ineligible to receive SNAP benefits. Similarly, β_w reflects the additional within-household food expenditure change between the first and the wth week of the month, for SNAP-eligible households relative to ineligible households.

The regression results in Table 3 confirm the visual evidence from Figure 1 for three different measures of demand. Column 1 measures changes in food expenditure on the intensive margin – within-month percentage differences in households expenditures, conditional on the household

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[9]SNAP benefits may be redeemed for purchases of most food categories other than prepared items and alcohol. We categorize expenditures as food or non-food according to UPC product groups in the data. Food categories include dairy, dry grocery (excluding pet food), frozen food, fresh produce, packaged meat, and deli. Non-food categories include alcoholic beverages, general merchandise, health and beauty care, non-food grocery items, and pet food.

[10]We restrict our data to the first four weeks of the month to maintain a consistent number of days in each month. Data on purchases made after the 28th day of the calendar month is excluded from all analyses.

spending a positive amount during the week. The coefficients of the non-interacted week variables (α_w) indicate that for SNAP-ineligible households, food expenditures are slightly higher (2 to 4 percent) during the first week of the month than in subsequent weeks. However, for SNAP-eligible households, the cyclicality in food purchases is substantially more pronounced. Relative to ineligible households, SNAP households reduce their food expenditures from the first week of the month by an additional 14 percent in the second week, 21 percent in the third week, and 23 percent in the fourth week.[11] In addition to reducing expenditures on the shopping trips they take, households may also vary the number of shopping trips they take over the course of the month. Column 2 of Table 3 repeats the analysis in Column 1 using as the outcome variable an indicator for whether the household makes positive food purchases during the week in question. The extensive margin results in Column 2 indicate that in addition to reducing average food expenditures per week, SNAP-eligible households in first of the month issuance states are slightly less likely to purchase food in later weeks of the month.

Column 3 of Table 3 combines the extensive and intensive margin results from Columns 1 and 2 into an overall measure of how food expenditures vary over the course of the month, following McDonald and Moffitt (1980).[12] While food expenditure among SNAP-eligible households decreases by 22 to 32 percent from the first week of the month to the following three weeks, food expenditure among SNAP-ineligibles decreases by only 2 to 5 percent over the calendar month. Taken together, the overall reduction in food expenditures in first of the month issuance states is a 27 percent reduction from the first week of the month to the fourth week among SNAP households relative to other households. This result is consistent with a large effect of SNAP issuance on the timing of food expenditures in first of the month issuance states.

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[11]These estimates are very similar to those reported in Hastings and Washington (2010).

[12]First, we regress $E[y|y > 0]$ and $P(y > 0)$ as outcome variables in the specification described above. Next, using the law of iterated expectations, we use the estimated coefficients to obtain $\frac{\partial E[y]}{\partial x} = \frac{\partial E[y|y>0]}{\partial x} P(y > 0) + \frac{\partial P(y>0)}{\partial x} E[y|y > 0]$. The results reported in Column 3 are converted to percentage terms by scaling the estimated coefficients by the unconditional mean of week 1 purchases.

ii. Non-Food Expenditure

Our next analysis turns from food to non-food expenditures. Mirroring Table 3, we estimate our regression on the intensive, extensive, and combined demand measures in Table 4. Interestingly, we observe a similar pattern in cyclicality as with food purchases. Households that are SNAP-eligible appear to spend substantially more on non-food purchases at the beginning of the month than at the end of the month. The results are very similar to the results for food expenditures. As with our analysis of food expenditures, we find that, for SNAP ineligible households, non-food expenditure is about 2 to 4 percent higher in the first week of the month than in the following three weeks. However, for SNAP eligible households, non-food expenditures decrease by over 25 percent over the course of the month.

That SNAP-eligible households reduce non-food expenditures over the course of the month is noteworthy, as SNAP benefits themselves can only be spent on food purchases. These findings are consistent with several possibilities. First, it could be that cyclicality in both food and non-food expenditures is attributable to calendar month patterns unrelated to SNAP. For instance, it could be that consumers spend more at the beginning of the month because that tends to be when they receive their paychecks, when they have paid off their rent or utility bills for the month, or when they receive payments from other benefit programs such as TANF or Social Security.[13] Although we document larger intra-month patterns in non-food expenditures for SNAP-eligible households compared to ineligible households, this could simply reflect the fact that SNAP-eligibility is highly correlated with income. After all, lower income households are more likely to be living paycheck to paycheck or have benefits from other transfer programs that represent a significant share of their income. A second hypothesis is that the monthly expenditure patterns for non-food purchases is driven by complementarities between non-food and food expenditures. That is, if a SNAP-eligible individual is going on his or her monthly large shopping trip, it may be easier to purchase

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[13]For example, Stephens Jr. (2006) finds evidence that "instant consumption" expenditures are highest shortly after paycheck receipt in the UK. Similarly, Stephens Jr. and Unayama (2011) finds evidence that consumption increases after pension receipt in Japan. In the U.S. context, Stephens Jr. (2003), Mastrobuoni and Weinberg (2009), and Mastrobuoni and Weinberg (2010) find evidence that that purchases of food and other non-durables increase after Social Security recipients receive their benefits. It is important to note that while Social Security was issued to all recipients in the first week of the month during the period considered in these two papers, Social Security benefits issuance dates are staggered throughout the month during our sample period.

non-food items along with the food items. Unlike the first hypothesis, this theory predicts that SNAP issuance policy does shape the timing of consumer food and non-food purchases. Finally, it could be that cyclicality in food expenditures is driven by SNAP issuance but that cyclicality in non-food purchases is driven by other monthly patterns that happen to be correlated with SNAP issuance in first of the month states. This hypothesis predicts that a state's SNAP issuance policy affects food expenditures but not non-food expenditures. To distinguish between these alternative possibilities, the next section utilizes state variation in the timing of SNAP issuance.

B. Expenditures in "Staggered" Issuance States

To shed light on whether it is the timing of SNAP issuance or some other monthly pattern that drives the observed cyclicality in expenditures, this section expands the analysis to states that issue SNAP benefits on days other than the first of the month. As described in Table 1, all but eight states fall into this category.

i. Food Expenditure

To begin, Figure 2 plots the average daily expenditures on food for households living in states that issue benefits on days spanning at least the first three weeks of the month. Comparing Figure 2 to Figure 1, it is notable that the spike in food expenditures at the month's beginning is dramatically attenuated. Although average food expenditure levels are higher at the beginning of the month than at the end of the month, the elevated level of expenditures are not all concentrated around a single day. This observation is consistent with the fact that the states whose data is included in Figure 2 issue benefits over a longer period of time than the states included in Figure 1 – only some eligible households will have received their benefits on the first of the month.

Table 5 presents the results of the regression analysis for food expenditures. Each column reports the combined intensive and extensive changes in intra-month consumption for a different set of state policies. Column 1 reports results for states that issue all benefits within the first week of the month, but not necessarily on the first day only. The patterns in these states are very similar to those in Table 3. Column 2 includes states that issue benefits on days that span the first

two weeks of the month. Food expenditure in SNAP households relative to non-SNAP households is constant across the first two weeks of the month, but significantly decreases in the second half of the month, consistent with SNAP issuance being completed for all households in these states by that point in time. Column 3, which considers states that stagger benefit issuance on days that span at least the first three weeks of the month, shows that food expenditure is almost completely constant for the first three weeks, but then decreases in the fourth week, at which point in time most of the states in the category have finished issuing benefits for the month. Finally, Column 4 reports food expenditure patterns for households living in the two states that issue all benefits in the second week of the month. Notably, food expenditure among SNAP households in these states is highest in the second week of the month and lowest in the first. These patterns are consistent with it being the timing of SNAP issuance – rather than other factors – that drives the observed cyclicality in intra-month food expenditures.

Table 6 presents the results from the following alternative econometric model which combines all issuance policies into one regression:

$$Y_{iwmy} = \beta\, FracIssue_{iwmy} * SNAP_{iy} + \alpha FracIssue_{iwmy} + \gamma SNAP_{iy} + \sum_{w=2}^{4} [\gamma_w week_w] + \delta_m + \eta_y + \theta_i \quad (2)$$

where $FracIssue_{swmy}$ is the fraction of SNAP benefits issued in week w in state of residence s of household i while $SNAP_{iy}$, $week_w$, δ_m, η_y , and θ_i are defined as in 1. As in Table 5, Y_{iwmy} is our combined measure of weekly food expenditure in dollars scaled by the average food expenditure in the first week of the month. In this regression, α represents the percent increase in food expenditure among SNAP-ineligible households in weeks in which 100 percent of SNAP are issued relative to weeks in which no benefits are issued. Similarly, β measures this effect for SNAP-eligible households relative to SNAP-ineligible households. The results suggest that if 100 percent of a state's SNAP benefits are issued in a given week, food expenditure is an insignificant 0.8 percent higher among SNAP-ineligible households and 21.5 percent higher among SNAP-eligible households (relative to ineligibles).

One concern with our data is that it measures food expenditure, not consumption. Therefore,

the cyclicality in food demand we observe in our data may be driven by SNAP-induced patterns in shopping behavior, but say very little about patterns of food consumption. To address this issue, we repeat the analysis in Table 5 separately for perishable food, which must be consumed shortly after purchase, and non-perishable food.[14] Table 7 presents these results. The results for both perishable and non-perishable food are very similar in magnitude suggesting that our main results are at least partly driven by changes in food consumption throughout the benefit month.

ii. Non-Food Expenditure

Table 8 repeats our main analysis for non-food expenditures. Relative to food expenditures, the evidence that non-food expenditures vary by SNAP issuance policy is substantially weaker. Comparing the estimated coefficients across columns, non-food expenditures are highest in the first week and steadily decline throughout the month, regardless of whether the state issues SNAP benefits in the first week only, the first two weeks, or the first three weeks of the month. We find one anomaly to this pattern in the two states that issue benefits during the second week of the month shown in column 4. In these states, non-food expenditure is highest in the second week of the month. These results provide moderate evidence in favor of a theory in which the cyclicality in non-food expenditures is driven by factors unrelated to SNAP issuance, rather than complementarities between food and non-food expenditures.

To summarize, we observe an "Nth-of-the-month effect" for food expenditures: aggregate food expenditures are only higher at the beginning of the month in states that issue SNAP benefits at the beginning of the month as well. In contrast, we find a robust *first*-of-the-month effect for non-food expenditures: households spend more on non-food items at the beginning of the calendar month, regardless of when SNAP benefits are issued. These results suggest that state issuance policy does affect monthly patterns of food expenditures by SNAP recipients, but that intra-month patterns of non-food expenditures are likely caused by other factors.

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[14]Perishable food includes dairy products, bread and baked goods, fresh produce, and non-frozen meat.

C. Within-State Variation in Issuance Policy

The identification strategy in the previous section relies on cross-sectional variation in issuance policy by state. If issuance policy were correlated with unrelated cross-state variation in monthly expenditures patterns for SNAP recipients, our results could be biased. This section investigates the effect of issuance policy on monthly expenditure patterns by exploiting within-state variation in issuance policy.

Most states have maintained a consistent issuance policy during our sample period but a few states have made changes. We focus our analysis on one state, Illinois, for two reasons. First, Illinois changed its policy in February 2010, which allows us almost two years of data before and after the policy change.[15] Second, Illinois's change in issuance policy was particularly large: the state changed its policy from issuing all benefits on the first of the month to issuing benefits on days spanning the first 23 days of the month.[16]

Table 9 estimates our regression model for households in Illinois before and after the policy change. Column 1 shows that, during the time period in which Illinois issued all benefits on the first of the month, food expenditure among SNAP households (relative to non-SNAP households) was highest during the first week of the month and gradually declined throughout the month. In contrast, after Illinois began staggering the benefit issuance date across participants, food expenditures appear to have become relatively constant throughout the month, as indicated by the results in Column 2, although the results are somewhat imprecise due to the reduced sample size in the post-reform sample period.

Because our within-state results are suggestive but relatively imprecise, we supplement the analysis with administrative data on SNAP benefit issuance and redemption obtained from the Illinois Department of Human Services. This data provides daily aggregate measures of the number of households receiving SNAP benefits and the amount of SNAP benefit dollars that were redeemed through food purchases from January 2008 to August 2014. While the Nielsen Consumer Panel spans only the single policy change in Illinois described above, the administrative data spans two

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[15]In contrast, Michigan, Oklahoma, and North Carolina each changed their issuance policy in 2011, the last year of our data.

[16]In contrast, while Idaho changed its issuance policy early in our sample period (November 2009), the change was from issuing all benefits on the first of the month to staggering issuance across the first five days of the month.

additional policy changes. In June 2013, Illinois changed its policy from issuing SNAP benefits on the first 23 days of the month to issuing benefits on the first ten days on the month, then in March 2014, Illinois reversed this decision by re-instating a policy that staggers benefit issuance across days 1 through 23.[17]

Figure 3 plots aggregate issuance and redemption data by calendar day for each of the four issuance policies that were in place in Illinois during our sample period. In each graph, the bars represent the fraction of SNAP households that received their benefits on each day of the calendar month. The line represents the proportion of total SNAP benefits that were redeemed on each calendar day. Figure 3a presents data during the period in which all benefits were issued on the first of the month. As noted above, this benefit schedule applies to the majority of SNAP recipients, but not all; during this period we observe that two thirds of all households received their benefits on the first.

Turning to the timing of benefit redemption, we observe a dramatic spike in the redemption of SNAP benefits in the first week of the month − 45 percent of all benefits are redeemed in the first week of the month and two thirds of benefits are redeemed in the first two weeks. Figure 3b presents the same analysis for the first period in which Illinois staggered its issuance date between the first and 23rd days of the month. While a third of households still receive their benefits on the first, the issuance date is spread more or less evenly across the rest of the issuance period. As in Figure 3a, redemptions closely track the issuance policy − 30 percent of benefit dollars were redeemed in each of the first two weeks and roughly 20 percent in the second two weeks of the month. Figures 3c and 3d correspond to the periods from July 2013 to February 2014 and March 2014 to the end of our sample period, respectively. These figures also provide evidence that as SNAP benefits are issued across a larger number of days, redemption patterns spread accordingly. Similarly, as the SNAP issuance period contracts, redemption peaks during the period of issuance. Along with the results in Table 9, these results suggest that the issuance policy changes in Illinois affected the monthly patterns of consumption in that state.[18]

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[17]These issuance changes applied to most, but not all, SNAP recipients in the state. Specifically, households that do not receive government provided health insurance in addition to SNAP follow a different issuance schedule. See the Illinois Department of Human Services website for more details.

[18]It is important to keep in mind that Figure 3 alone does not provide direct evidence that SNAP recipients

IV. SNAP Benefit Timing and Retailer Pricing

If demand for food by SNAP participants is characterized by predictable monthly fluctuations, retailers may be able to increase profits by raising prices during the days in the month in which demand is relatively high.[19] Past research provides support for this proposition: Hastings and Washington (2010) found that prices tended to be approximately 3 percent higher at the beginning of the month (when food expenditures were high) than at the end of the month (when food expenditures were low). As noted by those authors, this finding suggests that states should stagger the issuance of SNAP benefits over the course of the month to smooth fluctuations in aggregate demand, thereby ensuring that the incidence of the SNAP benefits remains with the SNAP participants. However, as noted above, the empirical evidence for this theory comes from data from only three stores. Moreover, because all three of the stores included in their sample are drawn from a single chain, the pricing results may not generalize to other retailers who may make pricing decisions in other ways. Finally, because all three of the stores were drawn from a single "first of the month" state, the authors could not test whether the results were being driven by the timing of SNAP issuance or by other monthly patterns.

A. Retailer Price Response by Issuance Policy

To investigate the effect of SNAP issuance timing on retailer pricing, we utilize the Nielsen Retail Scanner data. As described in Section II, this data set contains weekly price and sales data by product for over 10,000 grocery stores across the country. Following Hastings and Washington (2010), we create an expenditure-weighted food price index for each store-week:

$$log(P_{st}) = \sum_k \omega_k log(P_{kst}) \tag{3}$$

where P_{kst} is the unit price for UPC k sold in store s on date t and ω_k denotes the expenditure

reduce *total* food expenditures over the course of the month, only food expenditures purchased with SNAP benefit dollars. However, the evidence is consistent with the hypothesis that the timing of SNAP issuance is responsible for the observed monthly patterns in food expenditures.

[19]Basic economic theory suggests that a profit-maximizing retailer characterized by a positive marginal cost curve should increase prices in response to an upwards shift in the demand curve that it faces.

share for UPC k among SNAP-eligible households in the Consumer Panel data between 2004 and 2011. We normalize the shares to sum to one within a given store and year-month combination. Because Nielsen does not report a price for weeks in which a UPC was not sold in a given store, to maintain a consistent bundle of goods across weeks within a store-month we drop any UPC-store-month combination in which the UPC is not sold in the store in all weeks of the month.

We estimate a similar econometric model to that described in Equation (2) to estimate within-month pricing patterns across stores with different SNAP issuance policies:

$$\log(P_{st}) = \beta\, FracIssue_{swmy} + \sum_{w=2}^{4} [\gamma_w week_w] + \delta_m + \eta_y + \theta_s \tag{4}$$

where $\log(P_{st})$ is the price index defined above for store s on date t. $FracIssue_{swmy}$ is the fraction of SNAP benefits issued in week w in the state of store s. $Week_w$ is an indicator for week w, and δ_m, η_y , and θ_s are month, year, and store fixed effects, respectively. All regressions are volume-weighted and standard errors are clustered at the retailer level.

Table 10 presents these results. We find that in all states, food prices are slightly lower in the first week of the month than in all other weeks. These price changes are small (between 0.1 and 0.3 percent) but statistically significant. This finding suggests that there is some (albeit quantitatively minor) pricing cyclicality that is not related to SNAP-issuance. We also find statistically significant, yet economically insignificant estimates of the coefficient on the fraction of benefits issued in the week. Our estimate of 0.0007 for the coefficient on $FracIssue_{swmy}$ implies that if 100 percent of a state's SNAP benefits were issued in one week, prices in that week would be 0.07 percent higher than if no SNAP benefits were issued in that week. While small in magnitude, this result is qualitatively consistent with a model in which retailers increase their prices in response to SNAP-induced increases in food demand.

The most striking takeaway from these results is how small in magnitude this effect is. In particular, our point estimates are an order of magnitude smaller than those found in previous research. A 95 percent upper bound of our estimate suggests that prices in states that issue all SNAP benefits in the first week of the month are at most 0.1 percent higher in the first week of the month than in all other weeks – an effect that is roughly 30 times smaller in magnitude than

the estimates measured in Hastings and Washington (2010).

B. Why Don't Retailers Raise Their Prices to Capture SNAP-Induced Demand?

The results from the previous section suggest that retailers are not meaningfully changing their prices in response to predictable fluctuations in daily demand induced by SNAP. Simple economic theory suggests that profit-maximizing retailers should raise prices in response to outward shifts in demand – this section explores possible explanations for why they are not doing so.

i. Aggregate Sales Volume Patterns by Issuance Policy

Most basically, one possibility is that retailers are simply unaware of the intra-month fluctuations in demand for food induced by SNAP. This explanation is particularly plausible among retailers for whom the fraction of customers receiving SNAP is quite small. To determine if the food expenditure patterns of SNAP-eligible households observed in the previous section are perceptable to retailers, we repeat the regression analysis from Equation (4) for log food sales volume. As with our price index, we weight the expenditure of each product acording to the purchasing behavior of the SNAP-eligible households in the Consumer Panel data. Column 2 of Table 10 shows that aggregate food sales are 5.8 percent higher in weeks during which 100 percent of SNAP benefits are distributed.

Table 11 repeats this analysis by SNAP use in the store's zip code. Columns 1 through 4 present regression results for stores in zip codes where SNAP participation is less than 5 percent, 5-15 percent, 15-25 percent, and greater than 25 percent, respectively. These results show that our coefficient of interest (the coefficient on the fraction of SNAP benefits issued in a given week) monotonically increases with SNAP prevalence with estimates reaching 18.4 percent in stores in neighborhoods with the highest SNAP participation. This suggests that even if retailers were unsure whether the source of this expenditure fluctuation was the timing of food stamps issuance, they would still presumably be aware of the empirical fact that expenditures on food tend to fluctuate in predictable ways over the course of the month.

ii. Price Response by SNAP Prevalence

A second possibility is that retailers are constrained by their non-food stamp customers. Even if retailers could raise prices at the time of SNAP issuance without reducing purchases by SNAP participants, by doing so they might drive away price sensitive non-participants. If the price (non)response we observe in Table 10 is driven by this concern – that retailers do not raise prices for fear of driving away non-SNAP households – we would expect to observe larger pricing fluctuations in neighborhoods where a greater fraction of residents participate in SNAP. Table 12 repeats the analysis in Table 11 for prices. We find that the coefficient on the fraction of SNAP benefits issued in a given week for stores in zip codes where less than 5 percent of residents participate in SNAP is statistically indistinguishable from zero suggesting that food prices do not fluctuate with the SNAP issuance cycle at all in stores located in low SNAP-use areas. However, even in areas with the highest SNAP prevalence, prices are only 0.2 percent higher in weeks in which 100 percent of SNAP benefits are issued than in other weeks. So while overall, these results are consistent with price responses increasing with the local proportion of SNAP recipients, the fact that pricing effects are minuscule even in neighborhoods with high participation rates suggests that other factors are also contributing to the story.

iii. Price Response by Market Concentration

Third, it could be that retailers lack the market power to raise prices without substantially reducing the demand by SNAP participants. That is, it could be that although SNAP participants wish to purchase more food right after benefits are issued, they may be indifferent to which store they make their additional purchases at. In this case, a price increase by a particular grocery store could drive SNAP participants away. This explanation is consistent with recent findings that low-income consumers are more likely to price shop than other consumers (Kaplan and Menzio, 2013).[20] If this explanation is responsible for lack of price responses by retailers, we would expect to see more pricing effects by retailers in regions where the retailer has fewer competitors. In those neighborhoods, consumers would be less likely to respond to the higher prices by switching to a

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[20]In fact, if SNAP recipients search more intensely for low prices at the start of their benefit month when they make larger shopping trips, it may be optimal for retailers to engage in *countercyclical* pricing.

different retailer to make their SNAP purchases.

We test this hypothesis by examining the retailer response among stores that are located in areas with limited access to grocery stores versus those located in areas with several other competitors. We define a store to be in a "low market concentration" area if thre are no additional grocery stores from our data set located in the same zip code. Table 13 repeats our price analysis for stores located in low versus high market concentration neighborhoods and by low and high SNAP prevalence, where "high SNAP" areas are defined as zip codes where more than 25 percent of the population received SNAP. As we predicted, the price response is largest in stores located in low competition, high SNAP neighborhoods. However, the price response remains incredibly small even in these areas suggesting that it is unlikely that fear of losing SNAP participants to competitors is a chief reason that retailers do not respond to SNAP-induced fluctuations in food demand.

iv. Additional Models of Retail Pricing

There are a few additional pricing models that are worth mentioning in this section. In other contexts, researchers have documented negative prices associated with periods of high demand. Such results may be explained by "loss leader" marketing, in which retailers use low prices to encourage customers in the store to buy more total products (Chevalier, Kashyap and Rossi, 2003). Alternatively, sharp changes in demand during the month may increase grocery prices if retailers face variable costs associated with quickly adjusting supply. In fact, many grocery trade associations support staggering SNAP benefit issuance on the basis that it is costly for them to adjust employee hours and grocery stock throughout the month.

V. Conclusion

In this paper we have revisited the question of the relation between SNAP issuance timing and monthly patterns in consumption and retailer pricing, drawing on a new source of variation and expanded data availability. Our results confirm some findings from the prior literature and cast doubt on others. In particular, we document quantitatively large monthly cycles in food expendi-

tures by SNAP-eligible households. Unlike the prior literature, our identification strategy allows us to rule out that the observed cyclicality stems from monthly patterns unrelated to SNAP issuance. In contrast, whereas others have found that retailers raise food prices at the beginning of the month when SNAP-induced demand is at its peak, we show that such pricing cycles – to the extent they exist – are quantitatively insignificant. These results have important implications for policy: staggering SNAP issuance over the course of the month is likely to affect the timing of SNAP participants' food purchases but unlikely to substantially affect the food prices they face.

That retailers do not meaningfully raise prices in response to predictable fluctuations in SNAP participants' food demand is somewhat surprising. After all, simple economic theory suggests that profit-maximizing retailers would raise prices when faced with an outward shifts in the demand curve. Moreover, the cyclicality we observe in food expenditures is economically significant – we estimate that SNAP-eligible households living in states that issue all SNAP benefits on the first of the month spend 27 percent more on average in the first week of the month than in the fourth compared to non-SNAP households. Why wouldn't retailers take advantage of these patterns to boost their profits?

One possible explanation is that even savvy retailers are constrained in their ability to exploit SNAP-induced demand fluctuations by their non-SNAP customers. That is, even if a retailer were to raise prices in response to increased demand by SNAP participants, doing so would run the risk of driving away price sensitive non-participants. However, if this explanation for our observed (non)effect were correct, one would expect to observe larger pricing fluctuations in those neighborhoods where a greater fraction of participants participate in SNAP. Yet, as described in the previous section, the amount of pricing cyclicality in high-SNAP neighborhoods barely exceeds the amount in low-SNAP neighborhoods. Even in neighborhoods for which one in five households is SNAP-eligible, the monthly cyclicality we observe in food prices is all but negligible. This suggests that the presence of non-SNAP customers is not the main driver of the lack of price cyclicality we observe. However, it is certainly possible that if SNAP-participants constituted a sizable majority of all purchasers, retailers would become more willing to account for SNAP-induced demand when setting prices.[21]

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[21]For example, in the context of the Special Supplemental Nutrition Program for Women Infants and Children

Another possible explanation for why retailers do not raise prices in response to SNAP-induced fluctuations demand is if SNAP participants are too price-elastic with respect to any particular retailer. That is, although SNAP participants may be inelastic with respect to the day on which they purchase food, they may be quite flexible as to the particular retailer at which they shop.[22] Yet this explanation is also in some tension with the results of the empirical analysis described above. In particular, if SNAP participants' price sensitivity were responsible for the lack of a price response by retailers, we would expect to see more pricing cyclicality in neighborhoods in which the retailer has fewer competitors – that is, neighborhoods in which there are fewer alternatives for SNAP participants to substitute to for their food purchases. However, recall that we observe nearly identical monthly pricing patterns in low-food-access and high-food-access neighborhoods. Consequently, the high price elasticity of SNAP participants is also unlikely to be the primary explanation for why retailers do not set prices to account for monthly cycles in SNAP-induced demand.

A final possibility is that retailers may not set prices in response to SNAP-induced demand because their behavior is constrained by social norms against engaging in actions that could be considered as exploiting SNAP participants. Such norms may be internal – the retailers may themselves believe this behavior to be improper – or it could result from a fear that would-be customers would object to this behavior and as a result the retailer would lose profits. If this explanation is correct, it would underscore the importance of accounting for social norms in the behavior of firms as well as individuals (where it has been widely studied). Because we have provided evidence against other potential explanations for why retailers do not appear to account for SNAP-induced demand cycles when setting prices, we conclude that the role of social norms in shaping retailer behavior is worthy of further exploration.

(WIC) program, grocery stores have set up "WIC-only" outlets in which they stock WIC-eligible foods. By targeting WIC participants, such retailers enjoy a greater ability to charge above-market prices without driving away non-WIC customers.

[22]This explanation is consistent with recent findings that low-income consumers are more likely to comparison shop based on prices than are other consumers (Kaplan and Menzio, 2013).

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Table 1: Issuance Policy by State

Issuance Policy	State Abbreviation
Week 1 Only	AK*, CT, HI, ID*, **IL***, MT, ND*, NE, NH, NJ, NV*, **OK***, RI*, VA*, VT*, WY
Week 2 Only	ME, SD
Weeks 1 and 2	AR, AZ, CA, CO, DC, DE, FL, GA, IA, IN, KS, KY, LA, MA, MD, **MI**, MN, **NC**, NY, OH, OK, OR, PA, SC, TN, TX, UT, WA, WI, WV
Spread (3+ Weeks)	AL, **IL**, **MI**, MO, MS, **NC**, NM

Source: USDA Food and Nutrition Services

* Denotes states issuing benefits on the first day of the month.

Bolded states appear multiple times due to policy changes.

Additionally, four states changed their policy in the last quarter of 2012:

Georgia, South Carolina, and Tennessee spread issuance over 3+ weeks

and Virginia spreads issuance over weeks 1 and 2.

Alaska and Hawaii are not included in our data.

Table 2: Summary Statistics

	Full Sample (1)	SNAP (2)	Non-SNAP (3)
Panel A. Consumer Panel Data			
Number of Households	78,480		
Years in Panel	3.8		
Number of Household-Years	298,704	25,311	273,393
SNAP-eligibile	12.5		
Household Demographics			
Household Income	57,366	12,372	63,799
Household Size	2.4	2.4	2.4
Number of Children	0.9	1.0	0.9
Married (%)	46.1	25.0	49.1
Non-White (%)	25.7	27.3	25.5
Head of Household Demographics (%)			
Male: HS Grad	92.5	81.5	93.5
Male: Unemployed	0.5	2.0	0.4
Male: 50+ Years Old	56.6	60.4	56.2
Female: HS Grad	95.0	88.4	96.0
Female: Unemployed	0.8	1.6	0.6
Female: 50+ Years Old	55.0	61.8	54.0
Weekly Household Expenditure			
Food Expenditure ($)	35.46	32.54	35.88
Non-Food Expenditure	22.17	19.68	22.53
Any Food (%)	76.81	75.27	77.03
Any Non-Food (%)	66.69	63.91	67.09
Panel B. Retailer Data			
Number of Grocery Stores	10,070		
Average Annual Food Sales ($)	7.9M		
Average Local SNAP Prevalence	10.1		
% Low-Income, Low-Access	6.0		

Source: Nielsen Consumer Panel, 2004-2011 (Panel A);

Nielsen Retailer Scanner data, 2006-2012 (Panel B).

The table reports mean characteristics for full sample and by

SNAP eligibility.

Table 3: Food Expenditure Patterns in First of the Month States

	Intensive	Extensive	Combined
	(1)	(2)	(3)
SNAP*Week 2	-0.1379***	-0.0210***	-0.178***
	(0.0257)	(0.0063)	(0.015)
SNAP*Week 3	-0.2073***	-0.0226***	-0.234***
	(0.0270)	(0.0057)	(0.015)
SNAP*Week 4	-0.2326***	-0.0280***	-0.269***
	(0.0271)	(0.0064)	(0.014)
Week 2	-0.0387***	-0.0027	-0.039***
	(0.0062)	(0.0018)	(0.004)
Week 3	-0.0166**	0.0004	-0.019***
	(0.0074)	(0.0017)	(0.004)
Week 4	-0.0421***	-0.0097***	-0.051***
	(0.0076)	(0.0018)	(0.004)
SNAP	0.1452***	0.0239**	0.146***
	(0.0243)	(0.0094)	(0.013)
N	882,363	1,136,864	1,136,864

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

All specifications control for household, year, and calendar month fixed effects.

Outcome variables: log weekly food expenditure (intensive), indicator for purchasing any food during the week (extensive), weekly food expenditure in dollars divided by the average food expenditure in the first week of the month. Includes households located in states where all SNAP benefits are issued on the first day of the month.

Table 4: Non-Food Expenditure Patterns in First of the Month States

	Intensive	Extensive	Combined
	(1)	(2)	(3)
SNAP*Week 2	-0.0955***	-0.0373***	-0.107***
	(0.0242)	(0.0072)	(0.024)
SNAP*Week 3	-0.1603***	-0.0378***	-0.182***
	(0.0234)	(0.0071)	(0.023)
SNAP*Week 4	-0.1709***	-0.0508***	-0.207***
	(0.0268)	(0.0074)	(0.022)
Week 2	-0.0328***	0.0006	-0.033***
	(0.0058)	(0.0020)	(0.006)
Week 3	-0.0263***	0.0007	-0.021***
	(0.0060)	(0.0019)	(0.006)
Week 4	-0.0369***	-0.0083***	-0.044***
	(0.0063)	(0.0019)	(0.006)
SNAP	0.0943***	0.0349***	0.081***
	(0.0253)	(0.0090)	(0.021)
N	773,939	1,136,864	1,136,864

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

All specifications control for household, year, and calendar month fixed effects.

Outcome variables: log weekly non-food expenditure (intensive), indicator for purchasing any non-food items during the week (extensive), weekly non-food expenditure in dollars divided by the average food expenditure in the first week. Includes households located in states where all SNAP benefits are issued on the first day of the month.

Table 5: Food Expenditure Patterns by Issuance Policy

	1st Week	Week 1-2	3+ Weeks	2nd Week
	(1)	(2)	(3)	(4)
SNAP*Week 2	-0.118***	0.017***	0.016	0.313***
	(0.011)	(0.005)	(0.015)	(0.044)
SNAP*Week 3	-0.174***	-0.096***	0.027*	0.081**
	(0.011)	(0.005)	(0.015)	(0.038)
SNAP*Week 4	-0.210***	-0.164***	-0.053***	0.011
	(0.011)	(0.005)	(0.014)	(0.034)
Week 2	-0.027***	-0.017***	-0.011**	-0.020
	(0.003)	(0.001)	(0.005)	(0.014)
Week 3	-0.013***	-0.004***	0.012**	0.022
	(0.003)	(0.001)	(0.005)	(0.014)
Week 4	-0.047***	-0.038***	-0.030***	-0.017
	(0.003)	(0.001)	(0.005)	(0.014)
SNAP	0.084***	0.034***	-0.026*	-0.159***
	(0.010)	(0.004)	(0.013)	(0.032)
N	1,814,976	11,320,176	1,110,384	92,256

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

Includes households located in states where all SNAP benefits are issued in the first week only (column 1), the first two weeks only (column 2), across three or more weeks (column 3), or the second week only (column 4).

All specifications control for household, year, and calendar month fixed effects.

Outcome variable: weekly food expenditure in dollars divided by the average food expenditure in the first week of the month.

Table 6: Food Expenditure Patterns by Fraction of SNAP Issued per Week

	Food Expenditure
SNAP*Fraction Issued	0.215***
	(0.012)
Fraction Issued	0.008
	(0.004)
Week 2	-0.009**
	(0.002)
Week 3	0.004
	(0.003)
Week 4	-0.037***
	(0.003)
SNAP	-0.085***
	(0.008)
N	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the state level in parentheses.

"Fraction Issued" is the fraction of a state's SNAP benefits
issued in that week.

All specifications control for household, year, and calendar
 month fixed effects.

Outcome variable: weekly food expenditure in dollars divided
by the average food expenditure in the first week of the month.

Table 7: Perishable vs. Non-perishable Food Expenditure Patterns by Issuance Policy

	Perishable Food				Non-Perishable Food			
	1st Week	Week 1-2	3+ Weeks	2nd Week	1st Week	Week 1-2	3+ Weeks	2nd Week
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
SNAP*Week2	-0.114***	0.018*	0.004	0.316***	-0.122***	0.016	0.018	0.324***
	(0.022)	(0.010)	(0.023)	(0.095)	(0.023)	(0.011)	(0.030)	(0.123)
SNAP*Week3	-0.157***	-0.086***	0.019	0.124**	-0.185***	-0.103***	0.031	0.071
	(0.021)	(0.009)	(0.030)	(0.060)	(0.024)	(0.011)	(0.036)	(0.077)
SNAP*Week4	-0.190***	-0.146***	-0.053**	0.023	-0.224***	-0.176***	-0.052*	0.008
	(0.022)	(0.009)	(0.024)	(0.039)	(0.025)	(0.011)	(0.030)	(0.040)
Week2	-0.023***	-0.016***	-0.012*	-0.029*	-0.029***	-0.018***	-0.010	-0.016
	(0.005)	(0.002)	(0.006)	(0.016)	(0.005)	(0.002)	(0.006)	(0.017)
Week3	-0.007	-0.001	0.011*	0.017	-0.015***	-0.006***	0.012*	0.024
	(0.005)	(0.002)	(0.006)	(0.018)	(0.006)	(0.002)	(0.007)	(0.015)
Week4	-0.035***	-0.027***	-0.020***	-0.011	-0.051***	-0.042***	-0.034***	-0.021
	(0.005)	(0.002)	(0.006)	(0.020)	(0.006)	(0.002)	(0.007)	(0.019)
SNAP	0.067***	0.019*	-0.005	-0.199**	0.098***	0.043***	-0.035	-0.142*
	(0.026)	(0.010)	(0.033)	(0.083)	(0.027)	(0.011)	(0.034)	(0.074)
N	1,814,976	11,320,176	1,110,384	92,256	1,814,976	11,320,176	1,110,384	92,256

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

Perishable food includes dairy, bread and baked goods, fresh produce, and non-frozen meat.

Includes households located in states where all SNAP benefits are issued in the first week only (column 1 & 5), the first two weeks only (column 2 & 6), across three or more weeks (column 3 & 7), or the second week only (column 4 & 8).

All specifications control for household, year, and calendar month fixed effects.

Outcome variable: weekly (non)perishable food expenditure in dollars divided by the average (non)perishable food expenditure in the first week of the month.

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Table 8: Non-Food Expenditure Patterns by Issuance Policy

	1st Week	Week 1-2	3+ Weeks	2nd Week
	(1)	(2)	(3)	(4)
SNAP*Week 2	-0.053***	-0.041***	-0.124***	0.137**
	(0.019)	(0.008)	(0.028)	(0.056)
SNAP*Week 3	-0.115***	-0.089***	-0.130***	-0.042
	(0.019)	(0.014)	(0.032)	(0.053)
SNAP*Week 4	-0.148***	-0.143***	-0.175***	-0.073
	(0.018)	(0.007)	(0.034)	(0.052)
Week 2	-0.030***	-0.031***	-0.010	-0.020
	(0.005)	(0.002)	(0.007)	(0.019)
Week 3	-0.025***	-0.028***	0.002	-0.023
	(0.005)	(0.002)	(0.008)	(0.019)
Week 4	-0.047***	-0.048***	-0.019***	-0.027
	(0.005)	(0.002)	(0.007)	(0.019)
SNAP	0.054***	0.034***	0.137***	-0.023
	(0.016)	(0.007)	(0.044)	(0.047)
N	1,814,976	11,320,176	1,110,384	92,256

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

All specifications control for household, year, and calendar month fixed effects.

Outcome variable: weekly non-food expenditure in dollars divided by the average non-food expenditure in the first week of the month.

Includes households located in states where all SNAP benefits are issued in the first week only (column 1), the first two weeks only (column 2), across three or more weeks (column 3), or the second week only (column 4).

Table 9: Food Expenditure Patterns by Issuance Policy, Illinois

	Issue Date: 1st	Issue Date: 1-23rd
	(1)	(2)
SNAP*Week 2	-0.131***	0.023
	(0.024)	(0.038)
SNAP*Week 3	-0.166***	0.062
	(0.025)	(0.042)
SNAP*Week 4	-0.196***	-0.044
	(0.024)	(0.038)
Week 2	-0.028***	-0.022*
	(0.006)	(0.012)
Week 3	-0.003	-0.013
	(0.006)	(0.012)
Week 4	-0.032***	-0.039***
	(0.006)	(0.012)
SNAP	0.165***	0.021
	(0.021)	(0.058)
N	476,496	183,504

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Consumer Panel, 2004-2011.

Standard errors clustered at the household level in parentheses.

All specifications control for household, year, and calendar month fixed effects.

Outcome variable: weekly food expenditure in dollars divided by the average food expenditure in the first week of the month.

Includes households located in Illinois prior to March 2010 when all SNAP benefits were issued on the first of the month (column 1) and after the policy change which staggered issuance across the first 23 days of the month (column 2).

Table 10: Price and Sales Response by Issuance Policy

	Price	Sales Volume
	(1)	(2)
Fraction Issued	0.0007*	0.0580***
	(0.0004)	(0.0107)
Week 2	0.0030***	-0.0144***
	(0.0003)	(0.0050)
Week 3	0.0032***	-0.0023
	(0.0006)	(0.0060)
Week 4	0.0012**	0.0065
	(0.0006)	(0.0052)
N	22,850,351	22,850,351

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Retail Scanner Data, 2006-2012.

Standard errors clustered at the retailer level in parentheses.

All specifications include store, year, and calendar month fixed effects.

Outcome variable: log food price index (column 1) and log weekly food sales volume (column 2).

"Fraction Issued" is the fraction of a state's SNAP benefits issued in that week.

Table 11: Food Sales Response by SNAP Prevalence

	Less than 5	5-15	15-25	Greater than 25
	(1)	(2)	(3)	(4)
Fraction Issued	0.0187***	0.0549***	0.1119***	0.1843***
	(0.0066)	(0.0095)	(0.0175)	(0.0383)
Week 2	-0.0279***	-0.0183***	0.0010	0.0237*
	(0.0035)	(0.0045)	(0.0085)	(0.0137)
Week 3	-0.0068	-0.0058	0.0022	0.0099
	(0.0066)	(0.0063)	(0.0075)	(0.0200)
Week 4	0.0136***	0.0048	-0.0068	-0.0283
	(0.0049)	(0.0056)	(0.0077)	(0.0175)
N	6,750,483	10,875,875	4,134,530	994,033

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Retail Scanner Data, 2006-2012.

Standard errors clustered at the retailer level in parentheses.

All specifications control for store, year, and calendar month fixed effects.

Outcome variable: log weekly food sales volume.

"Fraction Issued" is the fraction of a state's SNAP benefits issued in that week.

Columns 1 through 4 include stores located in zip codes where the proportion of the population receiving SNAP is less than 5 percent, 5 to 15 percent, 15 to 25 percent, and greater than 25 percent, respectively.

Table 12: Price Response by SNAP Prevalence

	Less than 5	5-15	15-25	Greater than 25
	(1)	(2)	(3)	(4)
Fraction Issued	0.0005	0.0007*	0.0009	0.0016**
	(0.0005)	(0.0004)	(0.0006)	(0.0008)
Week 2	0.0027***	0.0030***	0.0030***	0.0033***
	(0.0004)	(0.0003)	(0.0003)	(0.0005)
Week 3	0.0026***	0.0033***	0.0035***	0.0041***
	(0.0006)	(0.0006)	(0.0009)	(0.0013)
Week 4	0.0009*	0.0013**	0.0013	0.0014
	(0.0006)	(0.0006)	(0.0008)	(0.0011)
N	6,750,483	10,875,875	4,134,530	994,033

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Retail Scanner Data, 2006-2012.

Standard errors clustered at the retailer level in parentheses.

All specifications control for store, year, and calendar month fixed effects.

Outcome variable: log food price index.

"Fraction Issued" is the fraction of a state's SNAP benefits issued in that week.

Columns 1 through 4 include stores located in zip codes where the proportion

of the population receiving SNAP is less than 5 percent, 5 to 15 percent,

15 to 25 percent, and greater than 25 percent, respectively.

Table 13: Price Response by SNAP Prevalence and Market Concentration

	High Market Concentration		Low Market Concentration	
	Low SNAP	High SNAP	Low SNAP	High SNAP
	(1)	(2)	(3)	(4)
Fraction Issued	0.0007*	0.0012	0.0007	0.0022*
	(0.0004)	(0.0007)	(0.0006)	(0.0013)
Week 2	0.0029***	0.0032***	0.0030***	0.0034***
	(0.0003)	(0.0005)	(0.0004)	(0.0007)
Week 3	0.0032***	0.0042***	0.0030***	0.0040**
	(0.0006)	(0.0009)	(0.0008)	(0.0019)
Week 4	0.0012**	0.0012	0.0012*	0.0016
	(0.0006)	(0.0009)	(0.0007)	(0.0017)
N	14,585,489	523,825	7,175,399	470,208

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Nielsen Retail Scanner Data, 2006-2012.

Standard errors clustered at the store level in parentheses.

All specifications control for store, year, and calendar month fixed effects.

Outcome variable: log food price index.

"Fraction Issued" is the fraction of a state's SNAP benefits issued in the given week.

"Low concentration" refers to stores with no other Nielsen grocery stores in the same zip code.

"Low SNAP" refers to stores in zip codes with less than 25 percent of residents receiving SNAP.

Figure 1: Food Expenditure by Calendar Day in "First of the Month" Issuance States
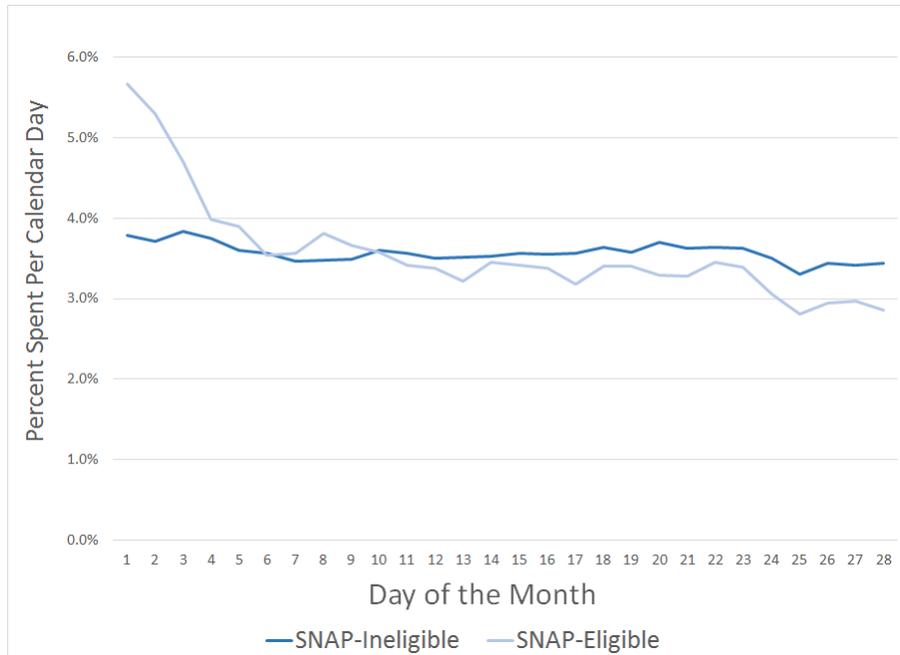
Figure 2: Food Expenditure by Calendar Day in "Staggered" Issuance States
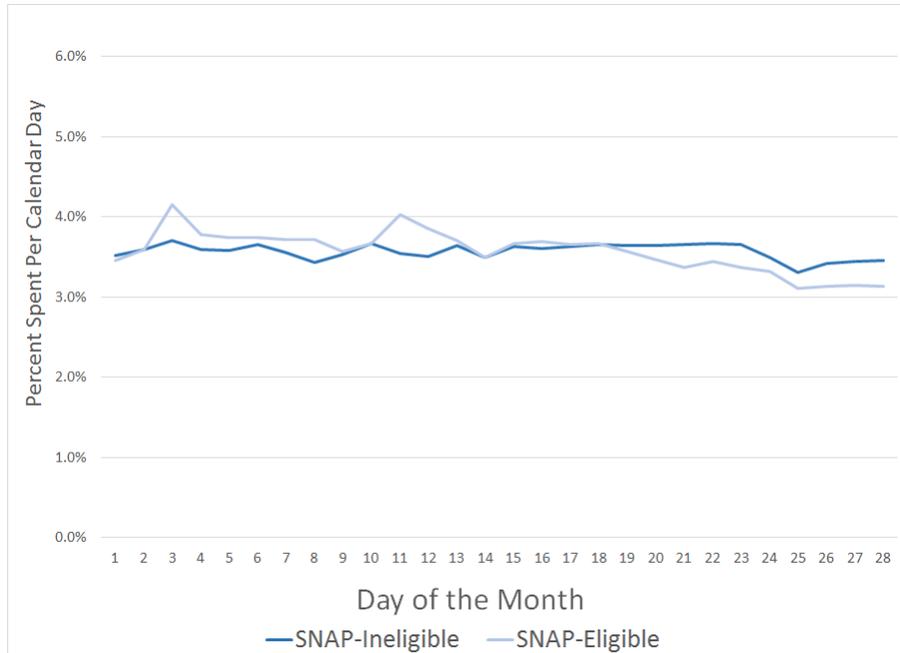
Includes households in states that issue SNAP benefits over at least three weeks.

Figure 3: Illinois SNAP Issuance and Redemption

(a) Jan 2008 to Feb 2010: Issued on Day 1

(b) March 2010 June 2013: Issued Days 1 to 23

(c) July 2013 to Feb 2014: Issued Days 1 to 10

(d) March 2014 to August 2014: Issued Days 1 to 23
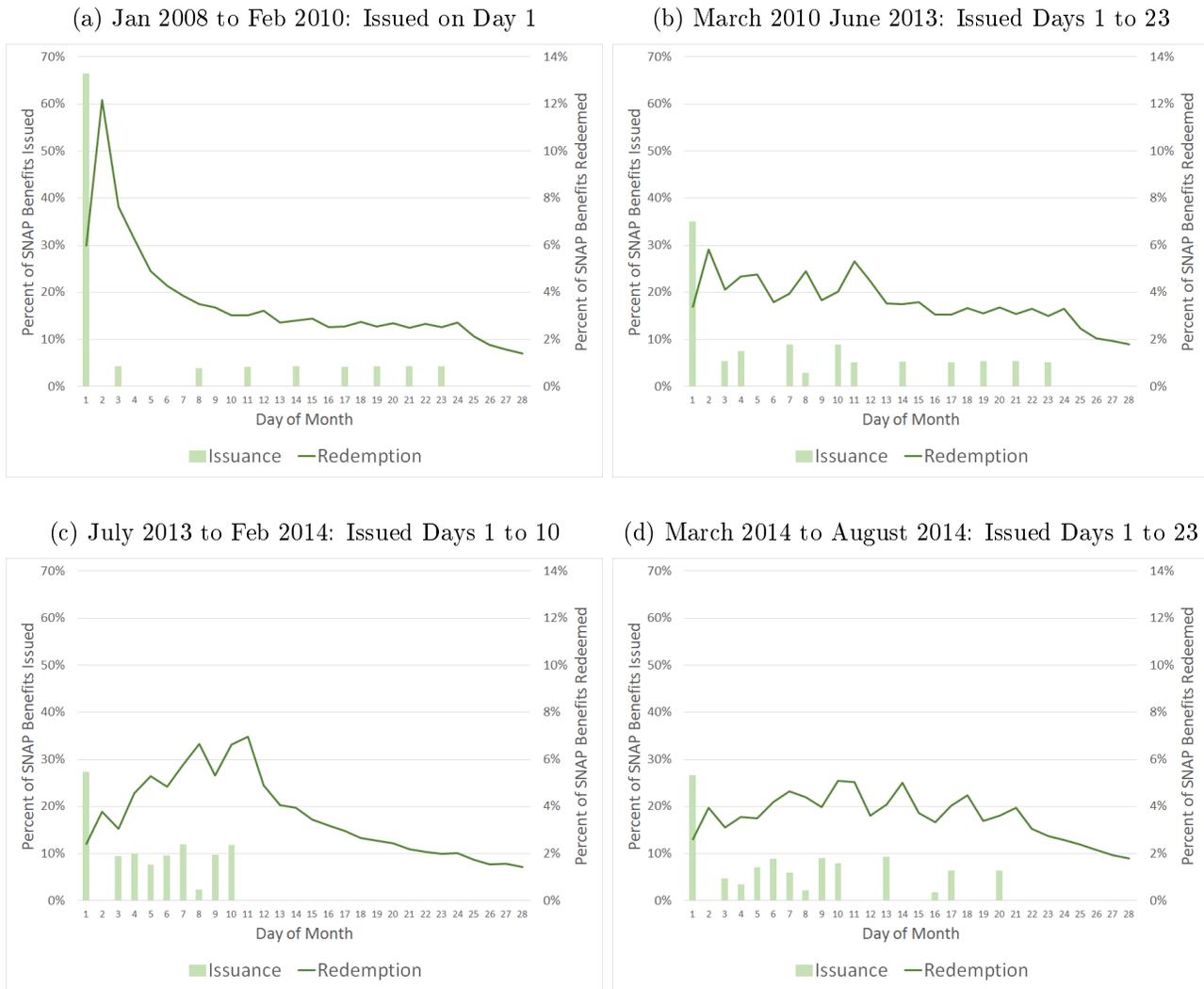
Source: Illinois Department of Human Services.

	Current Issuance Policy		Previous Issuance Policy		Change Date
Appendix Table A: SNAP Issuance Policy by State					
	First Day	Last Day	First Day	Last Day	
Alabama	4	18			
Alaska	1	1			
Arizona	1	13			
Arkansas	4	13	5	15	3/1/2005
California	1	10			
Colorado	1	10			
Connecticut	1	3			
Delaware	5	11			
D.C.	1	10			
Florida	1	15			
Georgia	5	23	5	14	9/1/2012
Hawaii	3	5			
Idaho	1	1	1	5	9/1/2009
Illinois	1	23	1	1	2/15/2010
Indiana	1	10			
Iowa	1	10			
Kansas	1	10			
Kentucky	1	10			
Louisiana	5	14			
Maine	10	14			
Maryland	6	15			
Massachusetts	1	14			
Michigan	3	21	1	9	1/1/2011
Minnesota	4	13			
Mississippi	5	19			
Missouri	1	22			
Montana	2	6			
Nebraska	1	5			
Nevada	1	1			
New Hampshire	5	5			
New Jersey	1	5			
New Mexico	1	20			
New York	1	10			
North Carolina	3	21	3	12	7/1/2011

Current issuance policy refers to issuance policy as of 2012 year end.

Appendix Table A (cont.): SNAP Issuance Policy by State

	Current Issuance Policy		Previous Issuance Policy		Change Date
	First Day	Last Day	First Day	Last Day	
North Dakota	1	1			
Ohio	1	10			
Oklahoma	1	10	1	1	4/1/2011
Oregon	1	9			
Pennsylvania	1	10			
Rhode Island	1	1			
South Carolina	1	19	1	10	9/1/2012
South Dakota	10	10			
Tennessee	1	20	1	10	10/1/2012
Texas	1	15			
Utah	5	15			
Vermont	1	1			
Virginia	1	9	1	1	10/1/2012
Washington	1	10			
West Virginia	1	9			
Wisconsin	2	15			
Wyoming	1	4			

Current issuance policy refers to issuance policy as of 2012 year end.