Examining Heterogeneity in the Supplemental Nutrition Assistance Program Benefit Cycle: A Finite Mixture Approach*

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Abstract

The Supplemental Nutrition Assistance Program (SNAP) is the largest nutrition assistance program in the United States. SNAP benefits are issued on a monthly basis, and recipients tend to redeem a larger share of benefits shortly after issuance, a pattern of behavior known as the SNAP benefit cycle. Previous research documenting the SNAP benefit cycle and its various impacts have often relied on cross-sectional survey data, with relatively small sample sizes, short periods of analysis, and self-reported SNAP participation and spending. In this study, I leverage a unique administrative panel dataset to investigate several aspects of the SNAP benefit cycle and uncover potential unobserved heterogeneity. The data include the universe of SNAP benefit transaction activity from 2011 to 2015 for 1.8 million unique households in Georgia, and detailed information regarding benefit receipt and redemption, including timing, dollar amount, and location of transactions. Using a panel data finite mixture model, I find evidence supporting the existence of two types of SNAP households, which I denote as slow and fast spenders. Fast spenders comprise the overwhelming majority of SNAP households, 77%, and spend approximately 70% of their benefit in the first week. In addition, fast spenders shop more frequently throughout the month, stay longer in the program, 3 years compared to 1 year and 4 months for slow spenders, and receive benefits that are almost twice as large, on average. The two groups show similar patterns of rural or urban residence, and the types of stores where they spend SNAP benefits. Finally, I also find that shopping frequency, tenure in SNAP, household SNAP benefit, and household store preferences are not strong predictors of household spending type. My results add to a more comprehensive understanding of the SNAP benefit cycle and inform welfare improving policies that promote smoother spending of SNAP benefits throughout the month.

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1 Introduction

The Supplemental Nutrition Assistance Program (SNAP) is the largest food assistance program in the United States disbursing nearly $114 billion in benefits in fiscal year (FY 2022) to over 41.2 million individuals (Leftin et al., 2024). Previous studies examining the SNAP program, reveal that SNAP recipients spend a significant amount of their monthly benefit early in the benefit month and that benefits do not last until the next issuance date (Wilde & Ranney, 2000; Shapiro, 2005; Castner & Henke, 2011; Todd, 2015), a pattern termed the SNAP benefit cycle. Abundant evidence suggests that the SNAP benefit cycle has significant nutritional consequences for participants. In particular, the SNAP cycle has been associated with low caloric intake during the last week of the benefit month (Wilde & Ranney, 2000), a decline in the daily caloric intake and the daily dollar value of food consumed (Shapiro, 2005), and a decline in dietary quality throughout the month (Tarasuk, McIntyre, & Li, 2007; Kharmats et al., 2014). Further, research indicates that the SNAP cycle might also exacerbate the risk of food insecurity. Hamrick & Andrews, 2016 find that SNAP recipients are more likely to have a day without eating at the end of the SNAP benefit month and Weinstein, Martin, & Ferris, 2009 find that low-income households have a significantly higher probability to report food insecurity at the end of the month as at the beginning.

A wide range of factors have been examined to explain the SNAP benefit cycle. Among these factors are institutional features of the program such as benefit size, and the timing of benefit disbursal (see Todd, 2015; Beatty, Bitler, Cheng, & Van der Werf, 2019), behavioral factors such as the time preferences of SNAP households (see Shapiro, 2005; Smith, Berning, Yang, Colson, & Dorfman, 2016), the fungibility of cash income and SNAP benefit income (see Smith et al., 2016), the shopping frequency of SNAP households (see Wilde & Ranney, 2000) and finally household demographic characteristics such as female headship, residence in the South, distance to store, and use of cash welfare (see Wilde & Ranney, 2000).

While the existence of the SNAP benefit cycle is well documented, there is relatively less research focused on examining SNAP spending behavior at the micro level. Further, many of the existing studies rely on survey datasets that employ small sample sizes, use relatively short periods of analysis, and rely on self-reported SNAP participation and SNAP spending leading to

potentially biased estimates due to measurement error. Finally, much of the existing research, models SNAP recipient spending behavior as originating from a single distribution, potentially ignoring heterogeneity in the spending behavior of these households, that might help explain the nature and causes of the cycle and uncover potential policy levers to target it.

In this study, I analyze a novel SNAP administrative panel dataset covering the universe of SNAP participating households in Georgia. This data contains every SNAP transaction for every participant over 5 years (2011 - 2015) and includes the addresses of SNAP authorized stores. Relative to previous studies, this dataset provides several advantages. First, SNAP participation and SNAP transactions are administratively recorded, freeing my estimates from issues caused by measurement error in these variables. Second, the extensive sample and panel nature of the data allows me to incorporate household specific variation in spending behavior in my analysis. Finally, the data offers great detail on the store choice of SNAP participants allowing for an estimation of the effect of these choices on the cycle.

Leveraging this data, I examine the SNAP benefit cycle, and investigate potential variables that correlate with the cycle. In particular, I investigate the relationship between the cycle and SNAP benefit size, store choice, shopping behavior, urban or rural residence, benefit saving behavior, and length of participation in SNAP. To examine heterogeneity in the cycle, I use a panel data finite mixture model[1] that allows different groups of SNAP recipients to display distinct patterns of spending throughout the benefit month. I use the empirical estimates to identify which group of SNAP households might be responsible for the SNAP benefit cycle, and further to identify household characteristics and behaviors that correlate with the cycle differentially among groups.

The mixture results produce several important insights. I discover a clear classification of SNAP households into two groups - designated as slow and fast spenders - that display starkly different patterns of spending of their monthly SNAP benefits. The overwhelming majority of SNAP households, 77%, are classified as fast spenders. The smaller group of slow spenders spends

[1] Mixture models are probabilistic models that assume the data are generated by several different unobserved processes and probabilistically assign each observation to each process or group (Dempster, Laird, & Rubin, 1977). These models have been widely used in a number of fields, including labor economics (Heckman, Robb, & Walker, 1990; Gritz, 1993), marketing (Wedel, DeSarbo, Bult, & Ramaswamy, 1993), industrial organization (Wang, Cockburn, & Puterman, 1998), and health economics (Deb & Trivedi, 1997). For a survey of the statistical literature on these models, see McLachlan, 2000.

approximately a tenth of their benefit within the first 7 days, while fast spenders spend a little more than two thirds of their benefit. Additionally, I detect correlations between a number of household variables and the SNAP cycle. First, a higher household benefit leads to greater spending, within the first 7 days, with the effect being more pronounced for faster spending households. This finding is noteworthy given that fast spending households receive a larger benefit, on average, compared to slow households, and spend a larger percentage of their benefit throughout the month, as well. Second, completing additional monthly transactions during the benefit month, leads to greater spending, within the first 7 days, for slow households, while reducing spending, during the same period, for fast spending households. These results are consistent with the fact that slow households conduct significantly less transactions both during the first 7 days and the full benefit month, compared to fast households.

Third, bulk shopping[2] is negatively associated with spending, during the first 7 days of the benefit month, for slow households, while being positively associated with spending for fast spending households. Slow households are more likely to bulk shop compared to fast spending households, but given their lower spending throughout the first 7 days, it seems evident that slow households bulk shop later in the month. Fourth, household residence does not play a prominent role in the SNAP benefit cycle for slow households, but small differences in the cycle are detected for fast households. Fifth, both groups share similar store type preferences, on average, with the preferred store for shopping, by a wide margin, being supermarkets. Consistent with this behavior, the estimated effects of shopping at the remaining store categories on the SNAP benefit cycle, are statistically significant but quite small in magnitude, across both groups. Finally, length of participation in SNAP is positively correlated with the SNAP benefit cycle, with the average tenure of the fast spending households being significantly higher compared to slow households.

The remainder of this paper is organized as follows. Section 2 describes the background and relevant literature. Section 3 describes the data. Section 4 presents preliminary descriptive evidence on the SNAP cycle. Section 5 describes the methodology. Section 6 discusses the results. Section 7 concludes.

[2] A bulk shopping episode occurs when a household completes at least one transaction, during a given benefit month, where it spends 40% or more of its benefit.

2 Background

2.1 SNAP: Institutional Background

The Supplemental Nutrition Assistance Program (SNAP) stated goal is to "permit low-income households to obtain a more nutritious diet...by increasing their purchasing power" (United States Department of Agriculture (USDA), 2022). To supplement a household's income, SNAP provides benefits via debit-like Electronic Benefits Transfer (EBT) cards that can be used to buy food in authorized retail food outlets.

To participate in SNAP, households must meet certain eligibility standards. First, a household's gross income generally cannot exceed 130 percent of the Federal poverty guidelines ($2,871 per month for a family of four in the United States in FY 2022). Additionally, a household's net income, gross income after certain deductions, cannot exceed 100 percent of the poverty guidelines ($2,209 per month for a family of four in the United States in FY 2022). Further, SNAP eligibility is also limited based on the household's resources. In FY 2022, households were permitted up to $2,500 in countable resources, whereas households with at least one elderly household member were allowed up to $3,750 in countable resources (USDA, 2022).[3]

Once a household is deemed eligible, it is assigned a certification period. Certification periods vary widely, ranging from 3 months to as much as 48 months. These periods are typically based on the likelihood of a change in the SNAP household's financial circumstances. Further, SNAP requires that most households be interviewed at least once every 12 months for recertification purposes. In FY 2022, the average certification period was 16 months (USDA, 2022).

SNAP maximum benefit amounts are defined using the Thrifty Food Plan (TFP), a low cost nutritionally adequate food plan that varies by household size and composition (Gundersen, Waxman, & Crumbaugh, 2019).[4] Household SNAP benefit levels are determined by subtracting 30% of the household's net income from the value of the TFP. Thus, SNAP benefits do not cover a household's full food budget, except when a household has zero net income, in which case, the

[3] SNAP has a series of exceptions in eligibility requirements that apply to certain households. For a detailed discussion of SNAP eligibility requirements, see USDA, 2022.

[4] For more details regarding the Thrifty Food Plan, see Thrifty food Plan.

household receives the TFP maximum benefit. In FY 2022, the average SNAP household received a monthly benefit of $297 (USDA, 2022). It is estimated that food-at-home expenditures account for 74% of SNAP households total food expenditures. SNAP benefits account for over 60% of the average food-at-home expenditures of SNAP households. This figure rises to 80% for SNAP households in deep poverty (household income below 50% of the Federal Poverty Guidelines) (Tiehen et al., 2017).

All states and territories provide SNAP benefits once monthly through EBT cards. In some states, SNAP benefits are issued on the same day for all participating households, typically on the first of the month. In contrast, other states stagger their benefit disbursal over multiple days. For example, in Georgia, benefit disbursal dates range from the 5th to the 23rd of the month.[5] There is considerable variation in these dates across states. Further, if unspent, SNAP benefit can carry over, for up to 9 months post disbursal. Any benefit that is not spent within 9 months of disbursal, is permanently removed from the account (USDA, 2024).

2.2 The SNAP Cycle: Conceptual Background

The life-cycle or permanent income hypothesis is a well established notion in current economic theory. This theory assumes that households' expectations of lifetime income will have a greater influence on their present decision-making than their current income (Friedman, 1957; Hall, 1978). Given that consumers are rational, have perfect information and access to credit, they can always borrow against future income to conduct consumption decisions in the present. A testable prediction from this theory is that consumption should be consistent with average lifetime income since individuals can borrow against future income and save when income is highest to maintain this level of consumption. However, empirical evidence indicates that in many cases individuals do not smooth their consumption over their lifetimes, and even shorter periods. This departure could be due to market imperfections or a variety of other economic causes. In the case of the SNAP benefit cycle, several factors have been proposed to justify the lack of spending and consumption smoothing. I discuss some of these factors in turn.

[5] For more details regarding SNAP benefit disbursal dates, see Benefit Disbursal Dates.

Perhaps the most evident of these factors is the size of SNAP benefits. SNAP maximum benefit amounts are defined using the Thrifty Food Plan (TFP), a low cost nutritionally adequate food plan that varies by household size and composition (Gundersen et al., 2019). Household SNAP benefit levels are determined by subtracting 30% of the household's net income from the value of the TFP. Thus, SNAP benefits do not cover a household's full food budget, except when a household has zero net income, in which case, the household receives the TFP maximum benefit. Evidence suggests however that SNAP benefits are generally not sufficient to meet the needs of SNAP recipients. The general argument posits that the TFP benefit design is not adequate as it fails to account for the time needed to prepare meals at home, does not properly account for the dietary needs of adolescent household members, and does not address geographic variations in the cost of goods (Yaktine & Caswell, 2013, Ziliak, 2016, Gundersen et al., 2019). Relatedly, Todd, 2015 examines the role of benefit size in the SNAP benefit cycle by exploiting an increase in SNAP benefits due to the American Recovery and Reinvestment Act (ARRA). Lending credence to this argument, Todd, 2015 finds that before ARRA, SNAP households experienced a decline of 25% in caloric intake during the fourth week of the month, a decline which is no longer present after the implementation of ARRA. Todd, 2015 concludes that an increase in SNAP benefits may help smooth food intake during the benefit month for SNAP recipient households.

Besides the generosity of SNAP benefits, paycheck cycles, and household receipt of other means-tested cash welfare or social insurance programs, have also been examined as potentially affecting the benefit cycle. Other sources of income could mitigate the SNAP cycle by increasing resources available to SNAP households. Further as wages increase, they would eventually reduce the value of the SNAP entitlement, therefore reducing SNAP spending in total and as a share of overall food spending, further reducing the magnitude of the SNAP cycle. On the other hand, the overlap between the timing of SNAP benefit issuance and receipt of social insurance and welfare payments, or paychecks, could lead to an overestimation of the SNAP cycle (Beatty et al., 2019). Using FoodAPS data, Beatty et al., 2019 examine the interactions between the SNAP, paycheck and other benefit cycles. The authors find only modest evidence that the SNAP cycle is affected by the timing of other sources of income, be it wage income or income from other government

programs. In particular, they find evidence that the cycle is more pronounced for workers who are paid on a weekly or monthly basis, but little evidence of a correlation between the SNAP cycle and cycles in other income streams. The authors conclude that other sources of income neither mitigate nor exacerbate the SNAP cycle.

There is evidence that the SNAP benefit cycle is partially due to the time inconsistent preferences of SNAP recipient households (Shapiro, 2005, Mastrobuoni & Weinberg, 2009). Based on Laibson, 1997 theory of hyperbolic discounting, time inconsistent households display short-run impatience, preferring present consumption to future consumption. These households are more likely to spend when resources are abundant, which leads to a fast depletion of financial resources and higher susceptibility to experiencing negative income shocks and food insecurity later in the month. Shapiro, 2005 finds that SNAP recipients' spending and food intake behavior is consistent with hyperbolic discounting. SNAP households' caloric intake and the dollar value of food consumed declines throughout the benefit month, implying a shift from higher quality/cost to lower quality/cost foods at the end of the benefit month. Relatedly, Smith et al., 2016 find that SNAP households spend approximately 96 cents of every food dollar on food at home on the day that benefits are issued. By the end of the month, just over three quarters of the household food budget is spent on food at home.

An additional factor that has been linked to the SNAP benefit cycle is income fungibility, referring to the degree of substitutability between SNAP income and income from other sources. Previous literature finds that SNAP households have a higher marginal propensity (MPS) to spend on food from benefit income compared to cash income (Fraker, Martini, & Ohls, 1995; Breunig & Dasgupta, 2002). Laibson, 1998 demonstrates that the monthly consumption path of an impatient household depends on its propensity to spend out of existing resources (Smith et al., 2016). Given that impatient SNAP households spend relatively more of their benefit upon receipt, the higher MPS on food out of benefit income could exacerbate this effect. Smith et al., 2016 examine the role of income fungibility and time inconsistent preferences on the SNAP benefit cycle and find that income fungibility and time-inconsistent preferences work in tandem with SNAP households spending 9.3% more on food at home out of SNAP than out of non-SNAP income on the day of

benefit arrival.

Finally, transportation difficulties, time constraints, a restrictive local food environment, or stigma could also be responsible for the SNAP benefit cycle. In particular, each of these factors could lead to less frequent shopping by SNAP households, resulting in large spending at the beginning of the month and trouble with storing food for consumption in later weeks as a consequence. Examining this possibility, Wilde & Ranney, 2000 propose a theory that households weigh the advantages of frequent shopping (less food spoilage, less need for smaller trips to closer, higher-priced stores toward the end of the month) against the disadvantages of frequent major grocery trips (stigma, loss of leisure time, and so on). Using an endogenous switching regression model where the consumer simultaneously chooses either a frequent or infrequent shopping regime and food intake levels in each half of the month, the authors find significant differences in the food intake for each regime. Specifically, for households that shop frequently, food intake is quite smooth over the food stamp month, while for households that shop infrequently, food energy intake declines significantly throughout the course of the food stamp month. Further, the authors find that total income, measured as food stamp benefits plus cash income, has no measurable marginal effect on food energy intake or the probability of shopping frequently. However, demographic factors and geographical factors affect both food energy intake and the probability of shopping frequently. In particular, participation in the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) is found to have a strong positive effect on food energy intake. Urban residence, receiving cash welfare, female headship, residence in the South, and distance to "major" grocery store all reduce the probability of shopping frequently.

The SNAP literature has extensively explored the nutritional consequences of the SNAP cycle and the myriad factors that might be responsible for this pattern of spending. A less explored area of research is the potential unobserved heterogeneity that might exist across SNAP households in response to SNAP receipt. To the best of my knowledge, the only study that directly addresses this question is Dorfman, Gregory, Liu, & Huo, 2019. Using a sample of 163 households from FoodAPS, and a finite mixture model, the authors uncover two groups of SNAP recipient households, which they denote as the patient and impatient groups. Out of 163 households, they find 63 households

in the impatient group (39% of the sample) and 100 households in the patient group (61% of the sample). Additionally, the authors find that impatient households spend 4 times as much of their monthly benefit within the first 4 days of the month (67.2% of their benefit) as the patient households (17.7% of their benefit).

This paper provides several contributions to the literature. First, it makes use of a novel restricted administrative panel dataset of SNAP recipients which avoids common issues that affect past studies, which often rely on survey or commercially available data, such as misreported SNAP participation (Kreider, Pepper, Gundersen, & Jolliffe, 2012), misreported SNAP expenditure information, and undersampling of disadvantaged populations (National Academies of Sciences, Engineering, and Medicine, 2020). Second, I re-examine the SNAP benefit cycle and investigate several variables that might correlate with the cycle such as: household benefit, household urban or rural residence, household store choice, household shopping behavior and finally household tenure in SNAP. I also explore observed heterogeneity in the cycle by household benefit size, tenure in SNAP and household benefit saving behavior. These results add to the extensive literature examining the myriad factors that correlate with the cycle. Finally I directly examine unobserved heterogeneity in the cycle. Using a panel data finite mixture model, that optimally separates SNAP households based on their spending behavior, I investigate the existence of different groups of SNAP households who might display significantly different spending patterns. Additionally, I use the mixture results to investigate household specific variables that might have differential effects on the spending behavior of these households. These results contribute to the more scarce literature examining heterogeneity in the SNAP benefit cycle. Further, to the best of my knowledge, this paper is the first in this literature to study heterogeneity in the cycle while explicitly accounting for household specific temporal variation in the cycle through a panel data finite mixture model.

3 Data

3.1 Households

I use administrative data containing the universe of SNAP transactions for all SNAP households in Georgia between January 2011 and December 2015. This data consists of approximately 400 million transactions from 1,848,137 unique participant households. For each transaction I observe the amount, the date, and the store name and address, but do not observe which items are purchased. For tractability, I collapse transaction-level data to a benefit month summary of transactions for each household. A benefit month for a given household is the period starting with the date of benefit receipt and ending the date before the next issuance. A typical benefit month lasts 31 days, as SNAP households typically receive benefits on the same calendar day during different months. Georgia SNAP households receive benefits at different dates during a given month, thus benefit month dates are household specific. The period of analysis ranges from January 2011 to December 2015, resulting in 60 benefit months in the data. Finally, I restrict the analysis sample to include only households whose benefit amounts received in any benefit month are greater or equal to \$15 and less or equal to \$1500.[6] The final analytical sample contains 34,770,457 benefit months generated by 1,555,674 households.

This dataset has several advantages that make it well suited to answering my research questions. First, the data covers the universe of SNAP participating households in Georgia. Thus SNAP participation is confirmed by administrative records, freeing my results from potential bias due to misclassification of SNAP participation. Further, my results are generalizable to the population of SNAP participants in Georgia and similar populations in other states. The second important feature of this data is that SNAP spending behavior is recorded electronically through administrative records, preventing errors related to self-reported spending behavior, and allowing for accurate and consistent tracking of household spending behavior over time. The third important feature of this data is the detailed information on stores where SNAP benefits are spent. This data allows for accurate tracking of store choice by SNAP households. Finally, the panel nature

[6] These cutoffs are consistent with the minimum and maximum allotments provided by the food and nutrition service at Food and Nutrition Service.

of this data allows me to examine household spending behavior over time, and investigate the role of length of participation in SNAP on the benefit cycle.

While the administrative data offer rich information on the benefit redemption patterns of SNAP households in Georgia, they are limited in other ways. First, the data do not contain information on the specific items that households purchase. Therefore I cannot examine the types of food purchased or the nutritional value of food consumed. Second, I do not observe any demographic information related to the households. Therefore I cannot explore the role of certain household characteristics such as household address, family size, income, race, among other variables, on SNAP household benefit spending behavior. Finally, the data contain only SNAP redemptions. Given that SNAP transactions constitute approximately 50% of SNAP household total food spending on average (Tiehen et al., 2017), the findings apply to a significant portion, but not the entirety, of household food spending.

3.2 Stores

One advantage of this dataset is its rich set of information regarding stores where households spend SNAP benefits. The data contain information about approximately 15,000 individual stores in Georgia where SNAP benefits are spent. For each store, I observe the name, street address and the dollar value of all SNAP transactions that occur at that store. However, I do not observe which foods households buy with their SNAP benefits. I rely on this information to examine the role of store choice on the SNAP benefit cycle. To accomplish this, I classify stores into 6 categories: supermarkets, grocery, convenience, combination, specialty foods and other. These categories are derived from the USDA Store Tracking and Redemption System (STARS).[7]

Supermarkets refers to stores that sell a wide variety of grocery and other store merchandise, and have multiple checkout lanes and registers. This collapsed category includes STARS supermarkets, superstores and military commissaries. Grocery stores refers to stores that carry a small, moderate, or wide selection of all four staple food categories, with their primary stock being food items. This collapsed category includes STARS small, medium and large grocery stores. Convenience refers

[7] For more information regarding the STARS classification system, see SNAP Store Type Definitions.

to self-service stores that offer a limited line of convenience items and primarily sell a variety of canned goods, dairy products, pre-packaged meats and other grocery items in limited amounts. This collapsed category is identical to the STARS convenience category. Combination refers to stores where the primary business is the sale of general merchandise but also sell a variety of food products. This category includes dollar stores, drug stores, and general stores. This category is identical to the STARS combination grocery/other stores category. Specialty foods refers to stores that operate as a cooperative or specialize in the sale of specific products such as bread/cereal products, fruits and/or vegetable products, meat products, and seafood products. Finally, Other refers to all remaining stores in the data that do not fit neatly into any of the above categories.[8]

3.3 Summary Statistics

Table 1 reports summary statistics for the analytical sample. The sample consists of benefit months generated by Georgia SNAP households from January 2011 to December 2015. There are 34,770,457 benefit months generated by 1,555,674 households. On average, SNAP households spend approximately 60% of their SNAP benefits within the first week of the benefit month, a strong indicator of the benefit cycle. SNAP households spend on average approximately 92% of their benefit during a given benefit month.[9] On average, households complete 4.31 transactions within the first 7 days and approximately twice as many, 8.76 transactions, during the full benefit month. This pattern of behavior indicates that households shop quite frequently during the first 7 days of the benefit month, consistent with their significant spending during the same period. Regarding stores where households choose to shop, supermarkets are the preferred choice. On average, households spend 74.71% of their monthly benefit at supermarkets, 5.37% at combination stores, 5% at convenience stores, 4.19% at grocery stores, 1.12% at specialty food stores and 1.16% at other stores.

To supplement my analysis, I define a number of additional variables. Tenure represents the number of benefit months a household spends in SNAP. Bulk shopping is a binary indicator that

[8] For a detailed, yet non-exhaustive, list of the individual stores that belong to the six collapsed categories, see Table 16.

[9] SNAP benefits can be rolled over, and occasionally households do not spend the full benefit they receive on a given benefit month.

takes value 1 if a household has at least one transaction that amounts to 40% or more of their benefit on a given benefit month. This variable aims to identify households who prefer to conduct few high value shopping transactions throughout the benefit month. Bulk shopping could serve as an indicator of several household circumstances, such as a preference for buying durable foods in bulk for storage, or an unwillingness to conduct multiple shopping trips throughout the benefit month due to, transportation difficulties, stigma associated with SNAP benefit use, among other factors. Further this variable allows me to investigate whether frequent shopping households have a less pronounced benefit cycle compared to infrequent (bulk shopping) households. To construct a proxy measure of household urban or rural residence, I rely on store zip codes. Using the Rural-Urban Commuting Area (RUCA) codes[10], I classify stores as either rural or urban using their zip codes. RUCA codes use measures of population density, daily commuting, and urbanization, to classify U.S. census tracts broadly as metropolitan, micropolitan, small town, and rural commuting areas. These classifications can also be applied at the zip code level. RUCA codes have been widely used by various health researchers and are also currently used as the basis for eligibility for many federal programs.[11] I rely on standard classifications of RUCA codes to identify rural and urban zip codes.[12]

In a given benefit month, I observe whether households complete at least two thirds of their transactions at rural or urban stores. If a household completes at least two thirds of their transactions at urban stores, during a given benefit month, then it is considered an urban household during that month. If instead, it completes two thirds of its transactions at rural stores, it is considered a rural household during the particular benefit month. If the household does not display a preference for shopping at urban or rural stores, during a given benefit month, then it is classified as a mixed household during that month.

On average, households spend approximately 36 benefit months (3 years) in the program. In

[10] For access to the documentation and RUCA codes datasets used in the analysis, see Economic Research Service RUCA Codes.

[11] For additional information on the origin and use of RUCA codes see Rural Health Research Center.

[12] In particular, I use the rural and urban classification definition listed as **categorization c**, provided by the Rural Health Research Center at the University of Washington, which originally developed the RUCA classification system jointly with the U.S. Department of Agriculture Economic Research Service (ERS) and the Federal Office of Rural Health Policy (FORHP). For detailed information on the available urban and rural classification systems, including **categorization c**, see Rural Health Research Center.

about half of all benefit months, households conduct at least one transaction where they spend 40% or more of their benefit. Finally, households are classified as urban households in 75.88% of benefit months, rural in 16.87% of benefit months, and mixed in 7.26% of benefit months.

4 SNAP Cycle by Benefit Size and Other Characteristics

I begin my analysis with simple descriptive tables to examine the SNAP cycle, identify potential variables that correlate with the cycle, and investigate heterogeneity by benefit size and tenure in the program.

Table 2 reports the results for the main (analytical) sample and by benefit size categories. I define three categories. Low benefit households which are households whose maximum benefit received in any benefit month is less than $100, moderate benefit households whose benefit received in any given benefit month is between $100 and $250 inclusive, and finally, high benefit households whose minimum benefit received in any benefit month is greater than $250.[13]

Perhaps, unsurprisingly, there is a positive association between the amount of dollars spent within the first 7 days of the benefit month and the benefit received by households. Low benefit households spend $21.97 within the first 7 days, followed by $109.96 for moderate benefit households and $295.14 for high benefit households. However, the results also reveal that the three groups spend approximately the same percentage of their benefit within the first 7 days. Low benefit households spend 58.77% of their benefit within the first 7 days, followed by 59.92% for moderate benefit households and 56.04% for high benefit households. These results seem to indicate that the SNAP benefit cycle stays fairly consistent across household groups who receive different benefit amounts. Regarding their spending behavior, during the full benefit month, low benefit households spend 93.38% of their benefit, followed by 91.47% for moderate benefit households and 90.69% for high benefit households.

A few additional differences are apparent across the three groups. There is a positive association between benefit size and the number of transactions a household completes, both during the first 7 days and throughout the full benefit month. There is a pronounced negative association

[13] These categories are mutually exclusive but not collectively exhaustive.

between bulk shopping and benefit size. Low benefit households are more likely to reside in rural areas compared to moderate and high benefit receipt households. Finally store type preferences seem fairly consistent across all three household groups with supermarkets being the preferred store followed by either combination, grocery, or convenience stores and then the remaining store categories.[14]

In Table 3, I examine the SNAP benefit cycle for the main sample and by tenure in SNAP. I define three groups of SNAP households. Low tenure households with tenure less or equal to 12 benefit months (1 year or less), moderate tenure households with tenure between 12 and 24 benefit months (1 year to 2 years non-inclusive), and high tenure households with tenure greater or equal to 24 benefit months (2 years or more). There is a positive association between tenure and the amount of dollars spent within the first 7 days of the benefit month. Low tenure households spend $119.65 within the first 7 days, followed by $140.13 for moderate tenure households and $180.02 for high tenure households. Further, the results indicate that there is a positive association between tenure and the percent of SNAP benefit spent within the first 7 days. Low tenure households spend 51.53% within the first 7 days, followed by 56.49% for moderate tenure households and 61.58% for high tenure households. These results indicate that the SNAP benefit cycle might be more prominent for households who spend a longer period of time in the program. Regarding their spending behavior during the full benefit month, low tenure households spend 90.50% of their benefit during the full benefit month, followed by 91.39% for moderate tenure households and 91.74% for high tenure households. Additionally, low tenure households receive the lowest benefit, on average, $246.06, followed by moderate tenure households, $260.19, and finally high tenure households, $299.49.

A few additional differences are apparent across the three groups. There is a positive association between tenure and the number of transactions a household completes, both during the first 7 days of the benefit month and throughout the full month. There is a slight negative association between bulk shopping and tenure. Low tenure households are more likely to reside in urban areas compared to moderate and high tenure households. Finally store type preferences seem fairly

[14] All differences between the benefit size category groups are statistically significant at the 1% level. For the results of significance tests of differences of means see Appendix Table A.1.

consistent across all three household groups with supermarkets being the preferred store followed by convenience, combination, grocery stores and finally the remaining store categories.[15] Next I systematically assess the SNAP benefit cycle through regression analyses as well as a panel data finite mixture model.

5 Empirical Strategy

5.1 Regression Analysis

My main research design models household i's log of SNAP dollars spent within the first 7 days as follows:

$$log7_{it} = \alpha_i + \boldsymbol{\beta}\mathbf{x}_{it} + \epsilon_{it} \tag{1}$$

$$\alpha_i = \psi + \boldsymbol{\gamma}\overline{\mathbf{x}}_i + \eta_i \tag{2}$$

In particular, equations 1 and 2 are combined to yield:

$$log7_{it} = \psi + \boldsymbol{\beta}\mathbf{x}_{it} + \boldsymbol{\gamma}\overline{\mathbf{x}}_i + \nu_{it} \tag{3}$$

where $log7_{it}$ represents the log of SNAP dollars spent within the first 7 days[16], for household i during benefit month t. The vector $\mathbf{x}_{it}$ includes the log of monthly benefit received by a given household; the number of transactions the household completes during a given benefit month; a binary indicator of whether the household completed at least one transaction where it spent 40% or more of its benefit during the benefit month; the log of dollars spent, during the benefit month, at grocery stores, convenience stores, combination stores, specialty food stores, or other stores;

[15] All differences between the tenure category groups are statistically significant at the 1% level. For the results of significance tests of differences of means see Appendix Table A.2.

[16] In previous studies, the percentage of benefit spent within the the first few days (3 to 4) of the benefit month, has been explored as a dependent variable (for an example, see Dorfman et al., 2019). In my analysis, an analogous counterpart to this variable is ratio, defined as the percentage of benefit spent within the first 7 days of the benefit month. However, using ratio as a dependent variable is complicated by the fact that ratio has significant point mass at zero and one, implying that multiple households often spend either none or all of their benefit within the first 7 days of the benefit month. Accommodating the nature of ratio in finite mixture models involves dealing with meaningful complications regarding estimation and identification of mixture subgroups, while not providing much added benefit, compared to a model that employs log of dollars spent within the first 7 days as the main dependent variable.

binary indicators for whether a household is a rural or mixed household; and a benefit month trend. The vector $\overline{\mathbf{x}}_i$ includes time averages of all the time varying covariates in $\mathbf{x}_{it}$. Regression errors are clustered at the household level.

Equation 3 illustrates the correlated random effects approach in panel data models (Mundlak, 1978 ; Chamberlain, 1982). A competing approach, which is commonly used in panel data models, is the fixed effects approach. I argue that, in my setting, the correlated random effects approach is preferred due to three main reasons. First, due to the nature of my data, it is plausible that for a significant portion of SNAP households, key independent variables such as the log of total credit, household urban, rural or mixed residence, among others, will show little variation over extended periods of time. This lack of variation could be due to a lack of changes in households' financial circumstances, residence, or behaviors. A fixed effects approach would prevent me from estimating the effect of these variables which are key in my analysis. The second, and potentially more important reason rests on a now well-established technical result. Specifically, given that I employ a linear regression model, the correlated random effects approach yields coefficients on the time varying variables that are identical to the ones recovered from a fixed effects regression employing the same time-varying variables.[17] Finally, one of the main goals of my analysis, is to examine unobserved heterogeneity in the SNAP benefit cycle, through a finite mixture model. As I will demonstrate in the next section, the correlated random effects approach leads to a simple and powerful adaptation of the finite mixture framework to panel datasets. A fixed effects approach however is not as easily implemented in the finite mixture framework.

5.2 Finite Mixture of Distributions

In order to explore unobserved heterogeneity in the SNAP benefit cycle, I apply a finite mixture model to the data. In this application, I use a normal finite mixture model which assumes that each group follows a normal linear regression model. My dependent variable is the log of SNAP benefit spent in the first 7 days of the benefit month. I expect to observe most of the variation in the spending patterns of SNAP recipients during this period, leading to accurate classification

[17] For discussion regarding this result, see Mundlak, 1978; Wooldridge, 2010.

of these households into groups, conditional on their spending. In addition, I also control for the same set of variables as described in my main specification, given by Equation 3.

In the finite mixture model, the random variable of interest is assumed to be a draw from a population that is an additive mixture of distinct subpopulations or classes (c) in proportions p_c where $\sum_{c=1}^{C} p_c = 1$, $p_c > 0 \; \forall \; c = 1, 2, ..., C$. For the log of SNAP dollars spent within the first 7 days of the benefit month, $log7_{it}$, the mixture density can be described in general by

$$g(log7_{it}|\Theta) = p_1 g_1(log7_{it}|\Theta_1) + p_2 g_2(log7_{it}|\Theta_2) + \cdots + p_C g_C(log7_{it}|\Theta_C) \tag{4}$$

where the class densities $g_c(log7_{it}|\Theta_c)$ are assumed to be normals, i.e.,

$$g_c(log7_{it}|\Theta_c) = \frac{1}{\sqrt{2\pi\sigma_c^2}} \exp\left(-\frac{1}{2\sigma_c^2}(log7_{it} - \psi - \boldsymbol{\beta}_c \mathbf{x}_{it} - \boldsymbol{\gamma}_c \overline{\mathbf{x}}_i)^2\right) \tag{5}$$

The mixing probabilities, p_c, regression coefficients, γ_c and β_c, and the standard deviation parameters, σ_c, are allowed to vary across classes.

The model is estimated by maximum likelihood using the Expectation Maximization (EM) algorithm and the Newton-Raphson method. The mixing probabilities are jointly estimated with the class-specific regression coefficients and standard deviations.

6 Results

6.1 Regression Results

6.1.1 Main Sample

Table 4 presents the results of estimating Equation 3 for the main sample and by the benefit size categories used in the descriptive analysis in Section 4. In column 1, I report the results for the main sample. In columns 2, 3, and 4, I report the results for the three benefit size categories.

Table 4 provides several interesting results. Examining the results for the main sample only, I find that consistent with the descriptive results, there is a positive correlation between credit

received by households and the amount of dollars spent within the first 7 days of the benefit month. In particular, a 1% increase in total household benefit leads to a 0.86% increase in the amount of benefit spent within the first 7 days of the benefit month. This result indicates that on average, for the main sample, increasing household benefit does not significantly reduce the magnitude of the SNAP benefit cycle.

Continuing with the main sample, completing an additional shopping transaction, during the benefit month, increases the amount of dollars spent within the first 7 days by 2.21%. This result is consistent with the descriptive finding that, on average, half of all benefit month transactions occur after the first 7 days of the benefit month. Bulk shopping, during a given benefit month, increases the amount of dollars spent within the first 7 days by 50.35%, indicating that potentially a significant amount of bulk shopping occurs during the first 7 days of the benefit month. Being a mixed household reduces the amount of dollars spent within the first 7 days by 1.17%, indicating that households who shop with similar frequency at urban and rural stores, spend slightly less of their benefit during the first 7 days of the benefit month, compared to households who shop primarily at urban stores. Finally, a 1% increase in dollars spent at either a grocery, combination, specialty or other store, increases the amount of dollars spent within the first 7 days by 0.026%, 0.006%, 0.024% and 0.024% respectively. Conversely, a 1% increase in dollars spent at a convenience store reduces the amount of dollars spent within the first 7 days by 0.005%. The effects estimated across the store categories are quite small, unsurprisingly, as most of household spending occurs at the reference store category, supermarkets.

6.1.2 Heterogeneity by Benefit Size, Saving behavior & Tenure

In columns 2 to 4 in Table 4, I present the results for Equation 3 by benefit size category. Total household benefit remains positively correlated with spending within the first 7 days. In particular, a 1% increase in total household benefit leads to an increase in the amount of benefit spent within the first 7 days of the benefit month, of 0.83% for low benefit households, 1.49% for moderate benefit households, and 0.40% for high benefit households. The magnitude of these effects differ meaningfully among the three groups, potentially underlying differences in the SNAP cycle among

them that warrant further exploration.

Completing an additional shopping transaction, during the benefit month, increases the amount of dollars spent within the first 7 days by 6.77%, 3.67%, and 2.01% for low, moderate and high benefit households respectively. Thus, additional monthly transactions have a more pronounced effect on spending within the first 7 days for lower benefit households. Bulk shopping during a given benefit month increases the amount of dollars spent within the first 7 days by 59.39%, 54.22%, and 43.06%, for low, moderate and high benefit households respectively, indicating that bulk shopping has a more pronounced effect on spending within the first 7 days for lower benefit households. Low benefit households, who reside in rural areas, spend 1.89% more dollars within the first 7 days, compared to low benefit urban resident households. Conversely, high benefit households, who reside in rural areas, spend 1.19% less dollars within the first 7 days, compared to high benefit urban resident households. Moderate and high benefit households who are classified as mixed area residents, spend 1.28% and 2.14% less dollars within the first 7 days, compared to similar benefit urban resident households. Finally, I examine the estimated effects across the store categories. These results are remarkably similar across low, moderate and high benefit households. Neither store category appears to play an outsized role in the SNAP benefit cycle for either of the three benefit groups. This result is consistent with the findings from the descriptive analysis where it was evident that the preferred store category among all three groups was supermarkets.

An important feature of the SNAP program is that SNAP benefits can rollover across different benefit months. Thus, households who spend a small amount of benefit during a given benefit month, could be choosing to accumulate benefits for spending in later benefit months. Since my main outcome measure only examines spending behavior within the first 7 days, it is unable to distinguish between households who spend nothing within the first 7 days, but spend most of their benefit in a given benefit month, and those who do not spend most or all of their benefit during the benefit month, and instead save it for future spending. Therefore, failing to account for household saving behavior could lead to an underestimation of the extent of the benefit cycle, as saving behavior could appear indistinguishable from budgeting behavior. To account for saving behavior, I re-estimate my main specification, Equation 3, using a sample that excludes any household who

spends less than 75% of their benefit in any given benefit month. I present these results in Table 5.

Most findings discussed in Table 4 remain the same in Table 5. Average household benefit size remains positively correlated with spending within the first 7 days, and the magnitude of effects follow the same pattern as for the main sample benefit size categories. The results regarding transactions, bulk shopping, rural or mixed residence also remain qualitatively similar. Finally, no substantive differences are discovered regarding the choice of store where households shop and the effect of this choice on spending within the first 7 days. Overall, these results provide suggestive evidence that the saving behavior of households is not a major factor affecting the SNAP benefit cycle.

An additional question of interest, concerns the relationship between length of participation in SNAP and the SNAP benefit cycle. For example, one could argue that low tenure households might display a more pronounced SNAP benefit cycle due to less familiarity with the SNAP program, with eligible stores, eligible products, and the most effective way to use SNAP benefits. However, high tenure SNAP households might instead show a more pronounced SNAP benefit cycle, if one associates a longer tenure with greater need for SNAP assistance, and a greater willingness to remain in the program, given that households must continuously meet recertification requirements. To examine this relationship, I estimate Equation 3 for the main sample and by tenure in SNAP, using the same three tenure categories as discussed in the descriptive results, Section 4, and present my results in Table 6.

First, consistent with the descriptive results, tenure is positively correlated with greater spending during the first 7 days of the benefit month. In particular, a 1% increase in total household benefit leads to an increase in the amount of benefit spent, within the first 7 days of the benefit month, of 0.58% for low tenure households, 0.80% for moderate tenure households, and 0.91% for high tenure households. Overall, these results show that an increase in total household benefit has a more pronounced effect on spending within the first 7 days for the highest tenure households.

Completing an additional shopping transaction, during the benefit month, increases the amount of dollars spent within the first 7 days by 5.05%, 3.44%, and 1.70% for low, moderate, and high

tenure households, respectively. Thus, I find a more pronounced effect of additional monthly shopping transactions, on spending within the first 7 days, for lower tenure households. Bulk shopping during a given benefit month is associated with a significant increase in the amount of dollars spent within the first 7 days of 50.04%, 53.45%, and 50.24%, for low, moderate, and high tenure households, respectively. Thus, bulk shopping has a more pronounced effect on spending, within the first 7 days, for moderate tenure households. In contrast, being classified as a mixed household reduces the amount of dollars spent within the first 7 days by 1.39%, 1.21%, and 1.17% for low, moderate and high tenure households, respectively. Additionally, moderate tenure rural households spend 1.16% less dollars within the first 7 days of the benefit month compared to moderate tenure urban households.

Finally, I examine the effects across the store categories. Similar to the main sample results and the heterogeneity analysis by benefit size, and saving behavior, no significant differences across the tenure groups are detected. Neither store category appears to play an outsized role in the SNAP benefit cycle for either of the three tenure groups. This result is consistent with the descriptive analysis, where it was evident that the preferred store category among all three tenure groups was Supermarkets.

Overall, the regression results provide several insights. First, a more generous benefit does not automatically lead to a less pronounced benefit cycle. In particular, a 1% increase in household benefit can lead to an increase in the amount of dollars spent within the first 7 days that ranges from 0.4% to 1.49%. The effect is most pronounced for moderate benefit households, followed by low and high benefit households. This pattern does not change once I account for household's saving behavior. Additionally, the elasticity of the amount of dollars spent within the first 7 days, with respect to household benefit, increases with tenure.

Second, additional monthly transactions are positively associated with the severity of the benefit cycle. In particular, an additional monthly transaction leads to an increase in the amount of dollars spent within the first 7 days, that ranges from 1.44% to 6.77%. The effect of additional monthly transactions on the SNAP benefit cycle decreases with benefit size, saving behavior, and tenure. Bulk shopping is positively associated with the benefit cycle. Specifically, bulk shopping during a

given benefit month, leads to a large increase in dollars spent within the first 7 days ranging from 38% to 59%. The effect of bulk shopping on the SNAP benefit cycle decreases with benefit size, and saving behavior.

Neither rural nor mixed residence seem to have very prominent effects on the benefit cycle, compared to urban residence. Finally, spending additional dollars during the month at either grocery, convenience, combination, specialty and other stores, while decreasing the amount of benefit spent at supermarkets, leads to small changes in the SNAP benefit cycle. The estimated effects, for the main sample, of a 1% increase in the amount of dollars spent at any of these stores, on the amount of dollars spent within the first 7 days, range between -0.0046% and 0.0262%. Thus relative to the supermarkets, the remaining store categories, seem to play a very small role in the benefit cycle. The results for household location and store choice are robust across the benefit size, saving behavior, and tenure subgroups.

6.2 Finite Mixtures Results

To uncover unobserved heterogeneity in the SNAP benefit cycle, I estimate a series of two-class finite mixture models. I restrict my attention to two-class finite mixture models for three main reasons. First, Figure 1 shows compelling evidence that there are two subpopulations of SNAP households. Second, previous studies[18] examining the SNAP benefit cycle have provided evidence supporting the existence of only two groups of SNAP spenders. Third, I estimate three class mixtures and find that results remain qualitatively similar.[19] Thus, for ease of exposition, I discuss two-class mixture results.

I start my analysis by estimating a two-class mixture using a 10% random sample of all households in the data.[20] This subsample contains 3,474,589 benefit months generated by 155,567 households. This analysis aims to shed light on the unobserved heterogeneity in the SNAP benefit cycle without restricting the subsample by household characteristics or spending behavior. In other words, the results from this analysis are representative of the unobserved heterogeneity present

[18] See Dorfman et al., 2019.
[19] These results are reported in Appendix Table A.3.
[20] To facilitate the feasibility of the finite mixture analysis, only subsamples are employed to conduct the analysis.

in the main (analytical) sample and, as such, serve as the main results from the finite mixture analysis. Additionally, to test the robustness of my finite mixture results, to household tenure in SNAP and household saving behavior, I re-estimate my two-class finite mixture model on two additional subsamples.

First, I restrict my data to only include households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month. This restriction yields 918,481 households who generate 19,795,513 benefit months. Subsequently, I extract a 10% random sample of households from this restricted sample. The resulting subsample contains 91,848 households who generate 1,986,510 benefit months. There are two main reasons for this analysis. First, unobserved heterogeneity in the cycle could depend on benefit size, as households who receive larger benefits might be more likely to smooth benefit spending. However, given that benefit size is tied to household size and potentially precarious financial circumstances, these households might instead display a more pronounced benefit cycle. Second, as previously mentioned, failing to account for household saving behavior could lead to an underestimation of the extent of the benefit cycle, as saving behavior could appear indistinguishable from budgeting behavior. This analysis aims to examine whether the unobserved heterogeneity, potentially present in the SNAP benefit cycle, varies conditional on the size of household benefit and household saving behavior.

Finally, I impose a number of restrictions on the main sample to create my final subsample. In this most restrictive subsample, I include only households who receive a minimum benefit of $100 dollars or more, spend at least 75% of their benefit in any given benefit month, spend a minimum of 24 benefit months in the program (2 years), and whose first recorded month of participation in the SNAP program is January 2012. These restrictions yield 38,059 households who generate 1,238,555 benefit months. Given the limited size of the restricted sample, I include all 38,059 households in the final subsample. This subsample allows me to examine variation in the benefit cycle among households who receive enough SNAP benefit to potentially smooth their consumption, display no benefit saving behavior, and have spent a considerable amount of time in the program allowing them to acclimate to program dynamics, familiarize themselves with SNAP eligible food items, SNAP stores, and recertification requirements. Further, by restricting household's first recorded

benefit month to January 2012, my finite mixture estimation excludes households with tenure prior to the start date of observation in my data which is in January of 2011.

From here on out, I will be referring to the three subsamples discussed as follows. The 10% random sample of all households in the data will be called the main subsample. The 10% random sample of households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month, will be called restricted subsample 1. The remaining subsample, the most restrictive, will be called restricted subsample 2. In Table 7, I present summary statistics for the main sample and main subsample. In Table 8, I present summary statistics for the restricted sample and restricted subsample 1. In Table 9, I present summary statistics for the main sample, and for restricted subsample 2. Tables 7 and 8 indicate that the summary statistics from the random samples closely match the statistics from the samples they were extracted from.

6.2.1 Main Subsample

Table 10 reports the results from the two-class finite mixture estimated using the main subsample, a 10% random sample of all households in the data. Two groups of SNAP recipients are found, which I denote as slow and fast spenders. Out of 155,567 households, I find 35,780 households in the slow group (23% of the sample) and 119,787 households in the fast group (77% of the sample). The fast group spends 12 times as many SNAP dollars ($147) within the first 7 days of the benefit month as the slow group ($12). The finite mixture results reveal a number of interesting patterns. The estimated coefficients indicate that a 1% increase in household SNAP benefit increases the amount of SNAP dollars spent within the first 7 days by 0.45% for slow households and 0.92% for fast households.

Completing an additional shopping transaction, during the benefit month, is associated with a 6.92% increase in the amount of SNAP dollars that slow spenders use in the first 7 days and a 1.04% reduction for fast spenders. Bulk shopping has a more pronounced effect on spending within the first 7 days for the slow spending group. In particular, I find bulk shopping during a given benefit month reduces the amount of SNAP dollars spent within the first 7 days by 53.64%

for slow households while increasing the amount of SNAP dollars spent within the first 7 days by 27.43% for fast households. In addition, I also document that rural and mixed household residence have little or no effect on the amount of dollars spent within the first 7 days of the benefit month compared to urban residence. Finally, I turn to the relationship between store choice and the SNAP benefit cycle where supermarkets are the base category. Here, I find that a 1% increase in the amount of SNAP dollars spent at either of the 5 store categories leads to a small, and mostly statistically significant, 0.0035% to 0.0384%, increase in SNAP benefit spent in the first 7 days across both groups. These results indicate that none of the 5 store categories seem to have a substantial effect on the SNAP benefit cycle.

Next I use the finite mixture estimates to calculate the posterior probabilities of households belonging to the slow or fast spending group.[21] With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20).[22] The classified sample contains 1,839,745 benefit months generated by 75,482 households. Of the 75,482 households, 6,985 belong to the slow spending group and 68,497 belong to the fast spending group. For each of these groups, I report the respective means of the independent variables in Table 11.

Table 11 offers several interesting insights. First, it is evident that slow households spend a much smaller percentage of their benefit within the first 7 days. In particular, slow households spend 8.67% of their benefit within the first 7 days compared to 70.07% for fast spending households. Consistent with this pattern of spending, slow households complete significantly less transactions, within the first 7 days, 0.65 compared to 5.29 transactions for fast households. Examining the behavior of these households throughout the full benefit month, slow households continue to spend less both in absolute and percentage terms, and complete less transactions compared to fast households. In particular, on average, slow households spend \$125.65, use 80.29% of their benefit, and complete 4.42 transactions within a benefit month, compared to \$293.54, 93.12% of benefit,

[21] The panel data finite mixture model generates multiple posterior probabilities for each household. Specifically, for a given household, each benefit month will be associated with a set of posterior probabilities, one for each group. I average these probabilities to retrieve a set of 2 posterior probabilities for each household, across the whole period of analysis. These average posterior probabilities are used to classify households as belonging to either the slow or fast group.

[22] These conservative classification thresholds are chosen to ensure an accurate classification of households into the respective groups. However, a consequence is that some households are not classified as either type, given their values of the average posterior probabilities. These households are not included in the analysis comparing means by group.

and 9.50 transactions for fast spending households. Additionally, slow households are more likely to bulk shop in any given benefit month, 62.36% chance, compared to fast spending households, 48.87% chance. However, given their lower spending throughout the first seven days, it is plausible that most of these bulk transactions occur after the first 7 days.

A priori, it is unclear whether a more generous benefit could lead to a less or more pronounced cycle. SNAP is a means-tested program, and presumably households who receive greater benefits are those in most need of these benefits. However, the larger benefit could allow these households to smooth their consumption, for instance, by stocking on durables and non-perishables, and planning their monthly food consumption by conducting multiple grocery trips. The finite mixture model estimates, and comparison of means post mixture estimation, indicate that the households who receive the highest benefit, present the more severe benefit cycle.

Further, it is also unclear whether longer tenure in SNAP should be associated with a more or less severe benefit cycle. Similar to a larger benefit, a longer tenure could also signal a greater need to participate in SNAP by a given household, especially considering that recertification periods depend on a household's financial circumstances. Further, longer tenure households might also be those who have chosen to continuously recertify further signaling their interest to stay in the program. In addition, a longer tenure may also provide a learning opportunity for households, to gain a better understanding of SNAP dynamics, SNAP benefits, and SNAP stores, among other factors, which may improve their SNAP benefits consumption patterns and reduce their probability of experiencing a severe benefit cycle. Here, the results also indicate a positive correlation between tenure and the SNAP benefit cycle. In particular, I find that slow households spend considerably less time on average in the program, 16 benefit months (1 year and 4 months) compared to fast spending households who stay in the SNAP program for 38 benefit months (3 years and 2 months).

Finally, regarding locations where households reside, I do not find major differences between slow and fast households. Most households in either group are classified as urban households (approximately 75%), followed by rural (approximately 17%) and finally mixed households (approximately 8%). Additionally, the choices of which store type to shop at, throughout the benefit month, are fairly similar between both groups as well. The preferred choice are supermarkets,

followed by either convenience or combination stores, grocery stores and the other two remaining categories, specialty and other stores.

6.2.2 Unobserved Heterogeneity by Saving Behavior & Tenure

Next, I discuss the results from estimating two-class mixture models using restricted subsamples 1 and 2. In Table 12, I present results for restricted subsample 1, the subsample of households who receive a minimum benefit of $100 or more and spend at least 75% of their benefit in any given benefit month. The striking feature of these results is the robustness of the finite mixture model estimates to accounting for the benefit size and saving behavior restrictions. Many of the findings from the main subsample analysis remain qualitatively the same.

In particular, I again find evidence of two groups of spenders, slow and fast spenders. The fast spending group spends 13 times as many dollars ($200) within the first 7 days of the benefit month as the slow group ($15). A 1% increase in the household SNAP benefit increases the amount of dollars spent within the first 7 days by 0.23% for slow spenders and 0.90% for fast spenders. Completing an additional shopping transaction, during the benefit month, is associated with a 6.94% increase in the amount of SNAP dollars spent within the first 7 days by slow spenders, and a 1.10% reduction for fast spenders. Bulk shopping, during a given benefit month, reduces the amount of dollars spent within the first 7 days by 53.18% for slow spenders and increases the amount of dollars spent within the first 7 days by 27.21% for fast spenders. Rural and mixed household residence continue to have little or no effect on the amount of dollars spent within the first 7 days of the benefit month compared to urban residence. Finally, store choice patterns and their effect on the SNAP benefit cycle remain qualitatively the same across both groups. For either group, none of the 5 store categories seem to have much of an effect on the SNAP benefit cycle.

Similar to the previously estimated results, I compare the means of the key independent variables, across the two groups estimated by this mixture model, using the same assignment rule and threshold, conditional on the posterior probabilities. The classified sample contains 54,732 households. Of the 54,732 households, 3,329 belong to the slow spenders group and 51,403 belong to the fast spenders group. The results are shown in Table 13. These results again remain remark-

ably consistent with the findings from the main subsample. Slow spenders continue to spend a much lower percentage of their benefit within the first 7 days. In particular, slow spenders spend 5.51% of their benefit within the first 7 days compared to 66.88% for fast spenders. Slow spenders continue to complete significantly less transactions, within the first 7 days, 0.49 compared to 5.69 for fast spenders and complete less transactions, throughout the full benefit month as well, 6.59 compared to 10.86 for fast spenders. Slow spenders continue to be more likely to bulk shop, 65.42% chance compared to 42.43% for fast spenders, receive a lower benefit on average compared to fast spenders, $248.77 and $371.68, respectively, and spend considerably less time in the program on average, 6 benefit months (6 months) compared to 38 benefit months (3 years and 2 months) for fast spenders.

Regarding locations where households reside, and their preferred store type, the patterns again remain extremely similar to the main subsample. Most households in either group are classified as urban households 81.52% and 76.88% for slow and fast households respectively, followed by rural 10.61% and 16.28% respectively, and finally mixed households 7.87% and 6.84% respectively. Finally the choices of where to shop throughout the benefit month are fairly similar between both groups as well. The preferred choice are supermarkets, followed by convenience, grocery or combination and lastly, specialty and other stores.

Finally, I discuss the results from estimating a two-class mixture model using restricted subsample 2. In Table 14, I present the results for restricted subsample 2, the subsample of households receiving a minimum benefit of $100 or more, who spend at least 75% of their benefit in any given benefit month, spend a minimum of 24 benefit months in the program (2 years), and whose first recorded month of SNAP participation in the data is January 2012. Despite the very restrictive nature of this subsample, the findings again remain remarkably consistent. Two groups of SNAP recipients are found, slow and fast spenders. Fast spenders spend 13 times as many dollars ($179) within the first 7 days of the benefit month as slow spenders ($13). A 1% increase in the household SNAP benefit increases the amount of dollars spent within the first 7 days by 0.27% for slow spenders and 0.87% for fast spenders.

Completing an additional shopping transaction, during the benefit month, is associated with

a 7.74% increase in the amount of SNAP dollars spent within the first 7 days by slow spenders, and a 1.10% reduction in the amount of dollars spent within the first 7 days by fast spenders. Bulk shopping, during a given benefit month, reduces the amount of dollars spent within the first 7 days by 41.54% for slow spenders, and increases the amount of dollars spent within the first 7 days by 29.80% for fast spenders. Rural and mixed household residence continue to have little or no effect on the amount of dollars spent within the first 7 days of the benefit month compared to urban residence. Finally, store choice patterns and their effect on the SNAP benefit cycle remain qualitatively the same across both groups, with neither of the 5 store categories having a pronounced effect on the SNAP benefit cycle.

Comparing the means of the independent variables, across the two groups, many of the previous results remain qualitatively the same. The results are presented in Table 15. The classified sample contains 24,111 households. Of the 24,111 households, 29 belong to the slow spenders group and 24,082 belong to the fast spenders group. Slow spenders continue to spend a smaller percentage of their benefit within the first 7 days. In particular, slow spenders spend 11.06% of their benefit within the first 7 days compared to 65.60% for fast spenders. Slow spenders continue to complete significantly less transactions, within the first 7 days, 0.71 compared to 5.08 for fast spenders, and complete less transactions, throughout the full benefit month as well, 3.84 compared to 9.78 for fast spenders. Further, slow spenders continue to be more likely to bulk shop, 83.39% chance compared to 44.70% for fast spenders, and receive a lower benefit on average compared to fast spenders, $197.82 and $328.17, respectively.

Regarding locations where households reside, and their preferred store type to shop, the patterns again remain extremely similar to the main subsample. Most households in either group are classified as urban households, 89.17% and 77.23%, for slow and fast households respectively, followed by rural, 5.79% and 15.40% respectively, and finally mixed households, 5.04% and 7.37% respectively. Finally the choices of where to shop throughout the benefit month are fairly similar between both groups as well. The preferred choice are supermarkets, followed by combination, grocery or convenience and lastly, the other two remaining categories, specialty and other stores.

6.2.3 Covariates Affecting Probability of Assignment

The mixture results reveal the existence of two groups of SNAP households: slow and fast spenders. In this section, I estimate linear probability models that attempt to predict group membership based on observable household characteristics. This analysis uses the classified sample from the main subsample mixture analysis. Group membership is determined using the same approach discussed in Section 6.2.1. Given that group membership relies on the average posterior probability of assignment, to identify household variables that correlate with group membership, I rely on household averages of some of the initial independent variables of interest and further, generate additional variables at the household level, that could provide relevant insights.

In particular, the covariates included are: the average monthly benefit received by a given household measured in hundreds of dollars; the average number of transactions the household completes during a given benefit month; bulk shopper, a binary indicator that identifies households whose probability of bulk shopping in any given benefit month is greater than 67%; rural, a dummy which identifies households who are classified as rural in at least 67% of their benefit months; urban, a dummy which identifies households who are classified as urban in at least 67% of their benefit months; mixed, a dummy which identifies the remaining households who do not meet the rural or urban criteria; finally, I generate a set of dummies which identify stores where households prefer to spend their benefits. In particular, a household is defined as having a preference for shopping at one of the six store categories, if it spends the highest monthly percentage of their benefit, on average, at that store.

In Table 17, I present the results from this analysis. The base group are slow spenders. All variables included are found to have a statistically significant effect on the probability of a household being a fast spender. However, these variables offer little predictive power ($R^2 = 0.0416$) and often are not economically significant. In particular, an increase in the average household benefit of \$100 reduces the probability of a household being a fast spender by 0.11 percentage points. Households who shop more frequently, on average, are 0.22 percentage points more likely to be fast spenders. Bulk shoppers are 0.41 percentage points less likely to be fast spenders. Rural households are 0.25 percentage points more likely to be fast spenders, while mixed households are 0.24 percentage

points less likely to be fast spenders. Spending an additional month in the program increases the probability of a household being a fast spender by 0.12 percentage points.

Finally, regarding store preferences, households who prefer to shop at alternative store categories instead of supermarkets, have a lower probability of being fast spenders. The estimated reductions, in the probability of being a fast spender, range from 1.74 percentage points to 5.71 percentage points. Specifically, the estimated reductions due to preferring grocery, other, convenience, specialty and combination stores instead of supermarkets are 1.74, 2.04, 2.44, 5.70, and 5.71 percentage points respectively. These effects are also the largest among the variables employed, implying that shopping preferences might serve as a potential useful indicator of SNAP household spending type.

7 Discussion & Conclusion

Previous research found that SNAP recipients spend a significant amount of their monthly benefit early in the benefit month. Further, this research indicated that this behavior was associated with nutritional consequences for SNAP households, potentially diminishing the effectiveness of the SNAP program in reducing food insecurity. However, most of the existing studies model SNAP recipient spending behavior as coming from the same distribution, potentially ignoring heterogeneity in the spending behavior of SNAP households that could explain the SNAP benefit cycle and uncover potential policy levers to target it. The basic premise of this study is that this approach misspecifies the true model and omits potentially important information.

Using restricted administrative panel data containing the universe of SNAP participating households in Georgia, and a panel data finite mixture model, I find compelling evidence supporting my view. My results indicate that there are two groups of SNAP households, slow and fast spenders. Fast spenders are the larger group, comprising an estimated 77% of households, with the remaining 23% being slow spenders. Additionally, fast spenders display a significant benefit cycle, spending approximately 70% of their monthly benefit within the first 7 days, compared to 9% for slow households. Exploiting the panel nature of my data, I examine the role of two features of the SNAP program that could plausibly have important repercussions for the SNAP benefit cycle, namely,

that SNAP benefits can rollover and further that SNAP households must recertify periodically to remain eligible for receiving SNAP benefits. I find that my results remain qualitatively the same, when I account for household saving behavior due to the rollover feature, or household tenure in the program.

Overall, my mixture results offer both positive and negative news. The positive news are that the slow group of SNAP spenders appear to budget their SNAP benefits throughout the month. Although, they only spend 9% of their benefit on average within the first 7 days, they spend approximately 80% throughout the full month. Further these households, receive a lower benefit, on average, compared to the fast spending households, $182 and $317 respectively. The negative news is that the overwhelming majority of SNAP households are fast spenders. These households spend a significant percentage of their benefit within the first 7 days, despite receiving a larger benefit on average, and further spend a longer period of time in the program, on average, 3 years and 2 months compared to 1 year and 4 months for the slow households.

Given the existing evidence linking the SNAP benefit cycle, to lower nutrient intake throughout the benefit month and potential food insecurity, these results provide strong justification for research focused on examining the SNAP cycle in greater detail and identifying potential policy levers to mitigate the cycle. Previous studies have suggested a number of potential avenues. First, creating educational programs focused on providing information to assist SNAP households in budgeting SNAP benefits might be effective. Potential tools that could encourage smoother spending and consumption include consumer education in food budgeting, nutrition, sources of affordable and healthy foods such as government food programs or local organizations, encouraging the use of grocery lists, among other factors. In recent years, the nutrition education component of SNAP (SNAP-Ed) has been significantly funded to provide SNAP households with guidance on obtaining healthy and affordable eating options. Future research could examine whether these efforts have yielded any gains in reducing the SNAP benefit cycle.

Another policy option would be to increase the frequency of SNAP benefit disbursal, or at the very least, allow households to opt into more frequent SNAP benefit disbursal. This policy has been suggested in a number of studies (Shapiro, 2005; Hastings & Washington, 2010; Todd, 2015;

Dorfman et al., 2019). Further, there is some anedoctal evidence to indicate that some SNAP households might indeed prefer a more frequent disbursal schedule (Fraker et al., 1995). While previous studies have examined the costs and benefits of a more frequent disbursal schedule, such as Shapiro (2005), the current SNAP program and its features might warrant a reexamination of this policy and its potential costs and benefits.

A third policy option would be to increase the size of SNAP benefits. SNAP benefits are determined using the TFP, a low cost nutritionally adequate food plan that varies by household size and composition (Gundersen et al., 2019). However, until recently, researchers argued that the TFP was long overdue for an update as it failed to reflect current economic circumstances and meet SNAP households dietary and food needs (Yaktine & Caswell, 2013; Ziliak, 2016; Gundersen et al., 2019). Todd (2015) provides results that support this reasoning. Specifically, examining the temporary 14% increase in benefits due to ARRA, Todd (2015) finds that this increase eliminated the end-of-month decline in caloric intake experienced across her sample of SNAP households. As a result of an update in the TFP in 2021, there has been a 21% increase in maximum SNAP benefits (U.S. Department of Agriculture, 2021). Future studies could evaluate the consequences of this benefit update to the SNAP benefit cycle.

Finally, it is important to recognize that the SNAP benefit cycle is not only due to the institutional features of the SNAP program, but likely also caused by household specific characteristics and circumstances. In fact, Wilde (2000) finds that demographic and geographic factors such as urban residence, residence in the South, female headship and distance to major grocery store all correlate positively with the cycle. Thus, it is evident that any policy efforts aimed at targeting the SNAP benefit cycle must consider the complex interplay of the myriad factors that underlie its existence. As the SNAP benefit cycle is closely tied to the specific circumstances of the households, be those financial, geographical or behavioral, ideal policies might be the ones, that in the absence of external interference, SNAP households would choose for themselves.

References

Beatty, T. K., Bitler, M. P., Cheng, X. H., & Van der Werf, C. (2019). Snap and paycheck cycles. *Southern Economic Journal*, *86*(1), 18–48.

Breunig, R. V., & Dasgupta, I. (2002). A Theoretical and Empirical Evaluation of The Functional Forms Used to Estimate The Food Expenditure Equation of Food Stamp Recipients: Comment. *American Journal of Agricultural Economics*, *84*(4), 1156–1160.

Castner, L., & Henke, J. (2011). *Benefit redemption patterns in the supplemental nutrition assistance program* (Tech. Rep.). Mathematica Policy Research.

Chamberlain, G. (1982). Multivariate Regression Models for Panel Data. *Journal of econometrics*, *18*(1), 5–46.

Cotti, C. D., Gordanier, J. M., & Ozturk, O. D. (2021). Does Distributing SNAP Benefits Later in The Month Smooth Expenditures? *Food Policy*, *104*, 102123.

Cuffey, J., & Beatty, T. K. (2022). Effects of competing food desert policies on store format choice among snap participants. *American Journal of Agricultural Economics*, *104*(4), 1485–1511.

Deb, P., & Trivedi, P. K. (1997). Demand for medical care by the elderly: a finite mixture approach. *Journal of applied Econometrics*, *12*(3), 313–336.

Deb, P., & Trivedi, P. K. (2013). Finite Mixture for Panels with Fixed Effects. *Journal of Econometric Methods*, *2*(1), 35–51.

Dempster, A. P., Laird, N. M., & Rubin, D. B. (1977). Maximum likelihood from incomplete data via the em algorithm. *Journal of the Royal Statistical Society: Series B (Methodological)*, *39*(1), 1–22.

Dorfman, J. H., Gregory, C., Liu, Z., & Huo, R. (2019). Re-examining the snap benefit cycle allowing for heterogeneity. *Applied Economic Perspectives and Policy*, *41*(3), 404–433.

Fraker, T. M., Martini, A. P., & Ohls, J. C. (1995). The Effect of Food Stamp Cashout on Food Expenditures: An Assessment of The Findings from Four Demonstrations. *Journal of human resources*, 633–649.

Friedman, M. (1957). A theory of the consumption function.

Goldin, J., Homonoff, T., & Meckel, K. (2022). Issuance and Incidence: SNAP Benefit Cycles and Grocery Prices. *American Economic Journal: Economic Policy*, *14*(1), 152–178.

Gritz, R. M. (1993). The impact of training on the frequency and duration of employment. *Journal of econometrics*, *57*(1-3), 21–51.

Gundersen, C., Waxman, E., & Crumbaugh, A. S. (2019). An examination of the adequacy of supplemental nutrition assistance program (snap) benefit levels: impacts on food insecurity. *Agricultural and Resource Economics Review*, *48*(3), 433–447.

Hall, R. E. (1978). Stochastic implications of the life cycle-permanent income hypothesis: theory and evidence. *Journal of political economy*, *86*(6), 971–987.

Hamrick, K. S., & Andrews, M. (2016). Snap participants' eating patterns over the benefit month: a time use perspective. *PloS one*, *11*(7), e0158422.

Hastings, J., & Shapiro, J. M. (2018). How are snap benefits spent? evidence from a retail panel. *American Economic Review*, *108*(12), 3493–3540.

Hastings, J., & Washington, E. (2010). The first of the month effect: consumer behavior and store responses. *American economic Journal: economic policy*, *2*(2), 142–62.

Heckman, J. J., Robb, R., & Walker, J. R. (1990). Testing the mixture of exponentials hypothesis and estimating the mixing distribution by the method of moments. *Journal of the American Statistical Association*, *85*(410), 582–589.

Kharmats, A. Y., Jones-Smith, J. C., Cheah, Y. S., Budd, N., Flamm, L., Cuccia, A., ... Gittelsohn, J. (2014). Relation between the supplemental nutritional assistance program cycle and dietary quality in low-income african americans in baltimore, maryland. *The American journal of clinical nutrition*, *99*(5), 1006–1014.

Kreider, B., Pepper, J. V., Gundersen, C., & Jolliffe, D. (2012). Identifying the effects of snap (food stamps) on child health outcomes when participation is endogenous and misreported. *Journal of the American Statistical Association*, *107*(499), 958–975.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics*, *112*(2), 443–478.

Laibson, D. (1998). Life-Cycle Consumption and Hyperbolic Discount Functions. *European economic review*, *42*(3-5), 861–871.

Leftin, J., Monkovic, M., Wang, F., Rahimi, N., Wen, A., & Vigil, A. (2024). Technical documentation for the fiscal year 2022 supplemental nutrition assistance program quality control database and the qc minimodel.

Mastrobuoni, G., & Weinberg, M. (2009). Heterogeneity in intra-monthly consumption patterns, self-control, and savings at retirement. *American Economic Journal: Economic Policy*, *1*(2), 163–189.

McLachlan, G. (2000). Finite mixture models. *A wiley-interscience publication*.

Mundlak, Y. (1978). On The Pooling of Time Series and Cross Section Data. *Econometrica: journal of the Econometric Society*, 69–85.

National Academies of Sciences, Engineering and Medicine. (2020). *A Consumer Food Data System For 2030 and Beyond.* Washington, DC: The National Academies Press.

Shapiro, J. M. (2005). Is there a daily discount rate? evidence from the food stamp nutrition cycle. *Journal of public Economics*, *89*(2-3), 303–325.

Smith, T. A., Berning, J. P., Yang, X., Colson, G., & Dorfman, J. H. (2016). The effects of benefit timing and income fungibility on food purchasing decisions among supplemental nutrition assistance program households. *American Journal of Agricultural Economics*, *98*(2), 564–580.

Tarasuk, V., McIntyre, L., & Li, J. (2007). Low-income women's dietary intakes are sensitive to the depletion of household resources in one month. *The Journal of nutrition*, *137*(8), 1980–1987.

Tiehen, Laura and Newman, Constance and Kirlin, John A. (2017). *The Food-Spending Patterns of*

Households Participating in The Supplemental Nutrition Assistance Program: Findings from USDA's FoodAPS. U.S. Department of Agriculture (USDA), Economic Research Service, August 2017.

Todd, J. E. (2015). Revisiting the supplemental nutrition assistance program cycle of food intake: Investigating heterogeneity, diet quality, and a large boost in benefit amounts. *Applied Economic Perspectives and Policy*, *37*(3), 437–458.

U.S. Department of Agriculture. (2021). *Thrifty Food Plan, 2021.* August 2021. FNS-916.

U.S. Department of Agriculture (USDA). (2024). *Do supplemental nutrition assistance program benefits expire.* U.S. Department of Agriculture (USDA), 2024. Retrieved from https://ask.usda.gov/s/article/Do-Supplemental-Nutrition-Assistance-Program-benefits-expire#:~:text=Any%20SNAP%20benefits%20in%20your,permanently%20removed%20from%20your%20account.

U.S. Department of Agriculture (USDA), Food and Nutrition Service, Office of Policy Support. (2022). *Characteristics of supplemental nutrition assistance program households: Fiscal year 2022.* by Mia Monkovic. Project Officer, Aja Weston. Alexandria, VA, 2024.

Wang, P., Cockburn, l. M., & Puterman, M. L. (1998). Analysis of patent data—a mixed-poisson-regression-model approach. *Journal of Business & Economic Statistics*, *16*(1), 27–41.

Wedel, M., DeSarbo, W. S., Bult, J. R., & Ramaswamy, V. (1993). A latent class poisson regression model for heterogeneous count data. *Journal of applied Econometrics*, *8*(4), 397–411.

Weinstein, J. L., Martin, K. S., & Ferris, A. M. (2009). Household food security varies within month and is related to childhood anemia. *Journal of Hunger & Environmental Nutrition*, *4*(1), 48–61.

Wilde, P. E., & Ranney, C. K. (2000). The monthly food stamp cycle: shopping frequency and food intake decisions in an endogenous switching regression framework. *American Journal of Agricultural Economics*, *82*(1), 200–213.

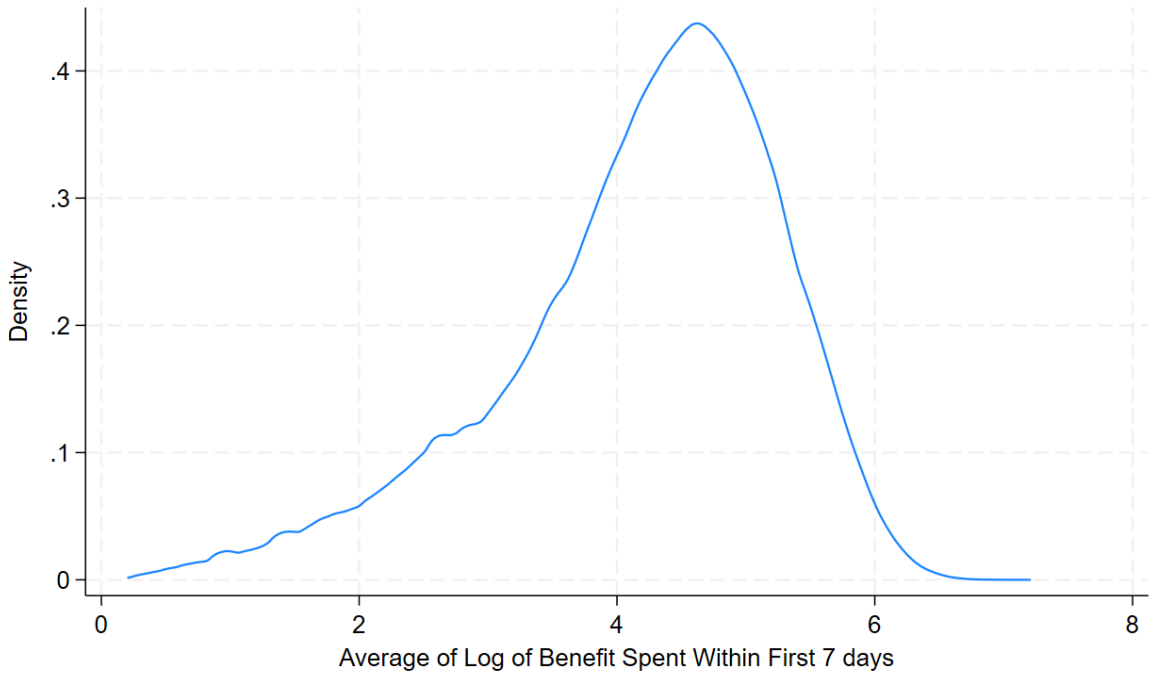
Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT press.

Yaktine, A. L., & Caswell, J. A. (2013). Supplemental nutrition assistance program: examining the evidence to define benefit adequacy.

Ziliak, J. (2016). Modernizing snap benefits. *The Hamilton Project Policy Proposal*, *6*.

TABLES & FIGURES

Figure 1: Kernel density, Household Average Log of $ Spent within the first 7 days, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Sample



Note: The Main Sample consists of all Georgia SNAP households during 2011 - 2015. The entire Sample contains 34,770,457 benefit months generated by 1,555,674 households.

Table 1: Summary Statistics 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households

	Mean	***Standard Deviation***
Amount Spent		
$ Within 7 days	167.47	150.23
% Within 7 days	59.72	33.54
$ Within Month	261.69	188.05
% Within Month	91.55	18.44
Transactions & Benefit Amount		
# of Transactions (7 days)	4.31	3.68
# of Transactions (Month)	8.76	6.87
Bulk Shopping (%)	49.26	49.99
Benefit Amount ($)	287.80	198.00
SNAP Tenure		
Tenure (Ben. Months)	35.80	15.80
Household Location		
Rural	16.87	37.45
Urban	75.88	42.78
Mixed	7.26	25.94
Store Choice ($)		
Supermarkets ($)	215.83	171.77
Grocery ($)	12.00	41.42
Convenience ($)	13.75	36.09
Combination ($)	13.40	32.80
Specialty Foods ($)	3.27	17.65
Other ($)	3.44	24.57
Store Choice (%)		
Supermarkets (%)	74.71	28.65
Grocery (%)	4.19	13.47
Convenience (%)	5.00	12.41
Combination (%)	5.37	12.86
Specialty Foods (%)	1.12	5.89
Other (%)	1.16	7.67
Households	1,555,674	
Benefit Months	34,770,457	

Notes: The sample consists of benefit months generated by the universe of SNAP participating households in Georgia during the period of January 2011 to December 2015. The entire sample contains 34,770,457 benefit months, generated by 1,555,674 households. Store choice refers to the $'s or % of benefit spent by households on average, at each store category, during a given benefit month.

Table 2: Summary Statistics 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Benefit Size

	Main Sample	***BA<$100***	***BA∈[$100,$250]***	***BA>$250***
Amount Spent				
$ Within 7 days	167.47	21.97	109.96	295.14
	(150.23)	(23.03)	(66.71)	(187.85)
% Within 7 days	59.72	58.77	59.92	56.04
	(33.54)	(42.25)	(35.02)	(29.45)
$ Within Month	261.69	33.79	167.63	476.85
	(188.05)	(23.71)	(43.73)	(183.95)
% Within Month	91.55	93.38	91.47	90.69
	(18.44)	(15.99)	(19.21)	(18.51)
Transactions & Benefit Amount				
# of Transactions (7 days)	4.31	1.39	3.65	5.90
	(3.68)	(1.51)	(3.14)	(4.20)
# of Transactions (Month)	8.76	2.47	7.07	12.90
	(6.87)	(2.10)	(5.20)	(7.70)
Bulk Shopping (%)	49.26	85.42	55.82	29.20
	(49.99)	(35.29)	(49.66)	(45.47)
Benefit Amount ($)	287.80	36.35	183.30	527.68
	(198.00)	(24.36)	(27.80)	(176.14)
SNAP Tenure				
Tenure (Ben. Months)	35.80	32.66	27.43	36.68
	(15.80)	(17.42)	(17.75)	(16.54)
Households	1,555,674	104,109	332,444	312,193
Benefit Months	34,770,457	1,730,014	4,279,901	6,419,025

Note: Main sample and breakdown by benefit size. BA represents benefit amount. Three groups are displayed: households whose maximum benefit amount received in any benefit month is less than $100, minimum of $100 and maximum of $250 inclusive, and households whose minimum benefit amount received in any benefit month is greater than $250. The benefit categories are mutually exclusive, but are not collectively exhaustive. For example, households who receive a minimum of $100 and a maximum benefit greater than $250 are not represented in these categories.

Table 2 (Cont'd): Summary Statistics 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Benefit Size

	Main Sample	***BA*<$*100***	***BA*∈[$*100*,$*250*]**	***BA*>$*250***
Household Location				
Rural	16.87	24.73	14.83	14.88
	(37.45)	(43.14)	(35.54)	(35.59)
Urban	75.88	67.67	77.75	78.46
	(42.78)	(46.77)	(41.59)	(41.11)
Mixed	7.26	7.60	7.42	6.66
	(25.94)	(26.50)	(26.21)	(24.94)
Store Choice				
Supermarkets ($)	215.83	27.13	135.54	396.01
	(171.77)	(23.54)	(58.26)	(184.56)
Grocery ($)	12.00	1.73	7.40	23.41
	(41.42)	(7.73)	(25.20)	(64.59)
Convenience ($)	13.75	1.42	10.89	22.86
	(36.09)	(5.81)	(26.40)	(52.82)
Combination ($)	13.40	2.74	9.38	22.04
	(32.80)	(7.94)	(22.24)	(47.59)
Specialty Foods ($)	3.27	0.41	2.20	5.74
	(17.65)	(3.23)	(11.57)	(26.36)
Other ($)	3.44	0.37	2.22	6.80
	(24.57)	(3.71)	(15.31)	(38.87)
Households	1,555,674	104,109	332,444	312,193
Benefit Months	34,770,457	1,730,014	4,279,901	6,419,025

Note: Main sample and breakdown by benefit size. BA represents benefit amount. Three groups are displayed: households whose maximum benefit amount received in any benefit month is less than $100, minimum of $100 and maximum of $250 inclusive, and households whose minimum benefit amount received in any benefit month is greater than $250. The benefit categories are mutually exclusive, but are not collectively exhaustive. For example, households who receive a minimum of $100 and a maximum benefit greater than $250 are not represented in these categories.

Table 3: Summary Statistics 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Tenure

	Main Sample	***T≤12***	***T∈(12,24)***	***T≥24***
Amount Spent				
$ Within 7 days	167.47	119.65	140.13	180.02
	(150.23)	(115.03)	(123.11)	(157.43)
% Within 7 days	59.72	51.53	56.49	61.58
	(33.54)	(36.22)	(34.39)	(32.71)
$ Within Month	261.69	220.00	235.96	273.01
	(188.05)	(156.61)	(164.16)	(195.26)
% Within Month	91.55	90.50	91.39	91.74
	(18.44)	(19.61)	(18.60)	(18.23)
Transactions & Benefit Amount				
# of Transactions (7 days)	4.31	3.33	3.85	4.55
	(3.68)	(3.24)	(3.39)	(3.77)
# of Transactions (Month)	8.76	7.72	8.30	9.01
	(6.87)	(6.20)	(6.53)	(7.01)
Bulk Shopping (%)	49.26	51.70	50.28	48.69
	(49.99)	(49.97)	(50.00)	(49.98)
Benefit Amount ($)	287.80	246.06	260.19	299.49
	(198.00)	(167.97)	(173.42)	(205.19)
SNAP Tenure				
Tenure (Ben. Months)	35.80	7.93	18.28	43.42
	(15.80)	(3.02)	(3.08)	(9.90)
Households	1,555,674	636,521	287,162	631,991
Benefit Months	34,770,457	3,861,033	5,094,561	25,814,863

Note: Main sample and breakdown by length of participation in SNAP. Length of participation in SNAP is measured by tenure (T), the number of benefit months a households spends in the program. Three groups are displayed: households whose tenure in SNAP is less or equal to 12 benefit months (1 year or less), between 12 and 24 benefit months exclusive (more than a 1 year and less than 2 years), and households whose tenure is greater or equal to 24 benefit months (2 years or more).

Table 3 (Cont'd): Summary Statistics 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Tenure

	Main Sample	***T*≤12**	***T*∈*(12,24)***	***T*≥*24***
Household Location				
Rural	16.87	13.24	14.57	17.86
	(37.45)	(33.89)	(35.28)	(38.30)
Urban	75.88	79.44	78.16	74.90
	(42.78)	(40.41)	(41.32)	(43.36)
Mixed	7.26	7.32	7.27	7.24
	(25.94)	(26.04)	(25.97)	(25.92)
Store Choice				
Supermarkets ($)	215.83	186.76	198.60	223.58
	(171.77)	(148.83)	(154.71)	(177.37)
Grocery ($)	12.00	7.32	8.64	13.36
	(41.42)	(30.64)	(33.39)	(44.08)
Convenience ($)	13.75	10.76	11.92	14.56
	(36.09)	(29.68)	(31.58)	(37.72)
Combination ($)	13.40	10.00	11.28	14.33
	(32.80)	(27.31)	(29.03)	(34.17)
Specialty Foods ($)	3.27	2.06	2.38	3.63
	(17.65)	(12.95)	(13.92)	(18.86)
Other ($)	3.44	3.11	3.14	3.55
	(24.57)	(23.21)	(23.14)	(25.03)
Households	1,555,674	636,521	287,162	631,991
Benefit Months	34,770,457	3,861,033	5,094,561	25,814,863

Note: Main sample and breakdown by length of participation in SNAP. Length of participation in SNAP is measured by tenure (T), the number of benefit months a households spends in the program. Three groups are displayed: households whose tenure in SNAP is less or equal to 12 benefit months (1 year or less), between 12 and 24 benefit months exclusive (more than a 1 year and less than 2 years), and households whose tenure is greater or equal to 24 benefit months (2 years or more).

Table 4: Regression Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Sample and Heterogeneity by Benefit Size

	(1) Main Sample	(2) BA<$100	(3) BA∈[$100,$250]	(4) BA>$250
Log Credit	0.8594***	0.8330***	1.4853***	0.4001***
	(0.0008)	(0.0054)	(0.0108)	(0.0039)
Transactions	0.0221***	0.0677***	0.0367***	0.0201***
	(0.0001)	(0.0010)	(0.0003)	(0.0001)
Bulk Shopping	0.5035***	0.5939***	0.5422***	0.4306***
	(0.0007)	(0.0038)	(0.0020)	(0.0015)
Log Grocery	0.0262***	0.0197***	0.0279***	0.0237***
	(0.0002)	(0.0020)	(0.0008)	(0.0004)
Log Convenience	-0.0046***	-0.0232***	-0.0088***	-0.0058***
	(0.0002)	(0.0021)	(0.0008)	(0.0005)
Log Combination	0.0058***	–0.0056***	0.0050***	0.0029***
	(0.0002)	(0.0014)	(0.0007)	(0.0004)
Log Specialty	0.0241***	0.0157***	0.0282***	0.0222***
	(0.0003)	(0.0028)	(0.0010)	(0.0005)
Log Other Stores	0.0242***	0.0180***	0.0302***	0.0249***
	(0.0004)	(0.0043)	(0.0015)	(0.0007)
Rural	-0.0033	0.0189**	0.0054	-0.0119**
	(0.0021)	(0.0085)	(0.0066)	(0.0051)
Mixed	-0.0117***	-0.0009	-0.0128***	-0.0214***
	(0.0014)	(0.0065)	(0.0044)	(0.0033)
Period	-0.0022***	-0.0023***	0.0008***	-0.0033***
	(0.0000)	(0.0001)	(0.0001)	(0.0000)
R-squared	0.3253	0.2110	0.0744	0.1377
Households	1,555,674	104,109	332,444	312,193
Benefit Months	34,770,457	1,730,014	4,279,901	6,419,025

Regressions use correlated random effects models. The dependent variable in all regressions is the log of dollars spent within the first 7 days of the benefit month. BA represents benefit amount. Four groups are displayed: (1) The main sample consisting of all households in the sample; (2) Households whose maximum benefit amount received in any benefit month is less than $100 ; (3) Households who receive a minimum benefit of $100 and maximum of $250 inclusive ; (4) Households whose minimum benefit amount received in any benefit month is greater than $250. The benefit categories are mutually exclusive, but are not collectively exhaustive. For example, households who receive a minimum of $100 and a maximum benefit greater than $250 are not represented in these categories. (*10%,**5%,***1%).

Table 5: Regression Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Sample and Heterogeneity by Benefit Size and Saving behavior

	(1) Main Sample	(2) BA<$100	(3) BA∈[$100,$250]	(4) BA>$250
Log Credit	0.8594***	0.8495***	1.4725***	0.4460***
	(0.0008)	(0.0056)	(0.0114)	(0.0040)
Transactions	0.0221***	0.0595***	0.0289***	0.0144***
	(0.0001)	(0.0011)	(0.0003)	(0.0001)
Bulk Shopping	0.5035***	0.5684***	0.4887***	0.3829***
	(0.0007)	(0.0039)	(0.0021)	(0.0016)
Log Grocery	0.0262***	0.0181***	0.0246***	0.0205***
	(0.0002)	(0.0021)	(0.0009)	(0.0005)
Log Convenience	-0.0046***	-0.0219***	-0.0073***	-0.0055***
	(0.0002)	(0.0021)	(0.0009)	(0.0005)
Log Combination	0.0058***	-0.0054***	0.0027***	0.0002
	(0.0002)	(0.0015)	(0.0007)	(0.0004)
Log Specialty	0.0241***	0.0147***	0.0244***	0.0181***
	(0.0003)	(0.0029)	(0.0011)	(0.0005)
Log Other Stores	0.0242***	0.0164***	0.0259***	0.0212***
	(0.0004)	(0.0044)	(0.0016)	(0.0007)
Rural	-0.0033	0.0151*	0.0092	-0.0064
	(0.0021)	(0.0088)	(0.0070)	(0.0053)
Mixed	-0.0117***	-0.0049	-0.0158***	-0.0215***
	(0.0014)	(0.0067)	(0.0046)	(0.0034)
Period	-0.0022***	-0.0023***	0.0010***	-0.0028***
	(0.0000)	(0.0002)	(0.0001)	(0.0000)
R-squared	0.3253	0.2079	0.0590	0.1245
Households	1,555,674	93,336	278,554	251,610
Benefit Months	34,770,457	1,634,050	3,773,554	5,499,285

Regressions use correlated random effects models. The dependent variable in all regressions is the log of dollars spent within the first 7 days of the benefit month. BA represents benefit amount. Four groups are displayed: (1) The main sample consisting of all households in the sample; (2) Households whose maximum benefit amount received in any benefit month is less than $100 and who spend 75% or more of their benefit in any given benefit month ; (3) Households who receive a minimum benefit of $100 and maximum of $250 inclusive and who spend 75% or more of their benefit in any given benefit month ; (4) Households whose minimum benefit amount received in any benefit month is greater than $250 and who spend 75% or more of their benefit in any given benefit month. These categories are mutually exclusive, but are not collectively exhaustive. (*10%,**5%,***1%).

Table 6: Regression Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Sample and Heterogeneity by Tenure in SNAP

	(1) Main Sample	(2) T≤12	(3) T∈(12,24)	(4) T≥24
Log Credit	0.8594***	0.5832***	0.8019***	0.9078***
	(0.0008)	(0.0034)	(0.0020)	(0.0009)
Transactions	0.0221***	0.0505***	0.0344***	0.0170***
	(0.0001)	(0.0003)	(0.0002)	(0.0001)
Bulk Shopping	0.5035***	0.5004***	0.5345***	0.5024***
	(0.0007)	(0.0024)	(0.0018)	(0.0008)
Log Grocery	0.0262***	0.0225***	0.0271***	0.0265***
	(0.0002)	(0.0012)	(0.0008)	(0.0002)
Log Convenience	-0.0046***	-0.0180***	-0.0114***	-0.0032***
	(0.0002)	(0.0011)	(0.0007)	(0.0003)
Log Combination	0.0058***	0.0009	0.0039***	0.0064***
	(0.0002)	(0.0009)	(0.0006)	(0.0002)
Log Specialty	0.0241***	0.0191***	0.0242***	0.0248***
	(0.0003)	(0.0015)	(0.0010)	(0.0003)
Log Other Stores	0.0242***	0.0308***	0.0258***	0.0233***
	(0.0004)	(0.0018)	(0.0012)	(0.0004)
Rural	-0.0033	-0.0127	-0.0116**	0.0010
	(0.0021)	(0.0086)	(0.0059)	(0.0022)
Mixed	-0.0117***	-0.0139**	-0.0121***	-0.0117***
	(0.0014)	(0.0055)	(0.0039)	(0.0015)
Period	-0.0022***	0.1085***	0.0152***	-0.0032***
	(0.0000)	(0.0004)	(0.0001)	(0.0000)
R-squared	0.3253	0.2087	0.2526	0.3599
Households	1,555,674	636,521	287,162	631,991
Benefit Months	34,770,457	3,861,033	5,094,561	25,814,863

Regressions use correlated random effects models. The dependent variable in all regressions is the log of dollars spent within the first 7 days of the benefit month. Length of participation in SNAP is measured by tenure (T), the number of benefit months a households spends in the program. Four groups are displayed: (1) The main sample consisting of all households; (2) Households whose tenure in SNAP is less or equal to 12 benefit months (1 year or less); (3) Households whose tenure in SNAP is between 12 and 24 benefit months exclusive (more than 1 year and less than 2 years); (4) Households whose tenure in SNAP is greater or equal to 24 benefit months (2 years or more). (*10%,**5%,***1%).

Table 7: Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main Sample and Main Subsample

	Main Sample	***Main Subsample***
Amount Spent		
$ Within 7 days	167.47	167.52
	(150.23)	(150.35)
% Within 7 days	59.72	59.79
	(33.54)	(33.57)
$ Within Month	261.69	261.60
	(188.05)	(188.56)
% Within Month	91.55	91.57
	(18.44)	(18.43)
Transactions & Benefit Amount		
# of Transactions (7 days)	4.31	4.31
	(3.68)	(3.68)
# of Transactions (Month)	8.76	8.75
	(6.87)	(6.88)
Bulk Shopping (%)	49.26	49.40
	(49.99)	(50.00)
Benefit Amount ($)	287.80	287.57
	(198.00)	(198.50)
SNAP Tenure		
Tenure (Ben. Months)	35.80	35.84
	(15.80)	(15.84)
Households	1,555,674	155,567
Benefit Months	34,770,457	3,474,589

Note: The main sample consists of benefit months generated by the Universe of SNAP participating households in Georgia. The main subsample refers to the benefit months generated by a 10% random sample of households from the main sample.

Table 7 (Cont'd): Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main Sample and Main Subsample

	Main Sample	***Main Subsample***
Household Location		
Rural	16.87	16.75
	(37.45)	(37.35)
Urban	75.88	76.01
	(42.78)	(42.70)
Mixed	7.26	7.23
	(25.94)	(25.90)
Store Choice		
Supermarkets ($)	215.83	215.74
	(171.77)	(172.16)
Grocery ($)	12.00	12.11
	(41.42)	(41.68)
Convenience ($)	13.75	13.66
	(36.09)	(36.02)
Combination ($)	13.40	13.34
	(32.80)	(32.78)
Specialty Foods ($)	3.27	3.28
	(17.65)	(17.77)
Other ($)	3.44	3.46
	(24.57)	(24.55)
Households	1,555,674	155,567
Benefit Months	34,770,457	3,474,589

Note: The main sample consists of benefit months generated by the Universe of SNAP participating households in Georgia. The main subsample refers to the benefit months generated by a 10% random sample of households from the main sample.

Table 8: Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Restricted Sample and Restricted Subsample 1

	Restricted Sample	***Restricted Subsample 1***
Amount Spent		
$ Within 7 days	206.24	206.28
	156.43	156.47
% Within 7 days	59.85	59.82
	31.55	31.55
$ Within Month	326.18	326.44
	184.91	185.01
% Within Month	93.10	93.10
	16.04	16.04
Transactions & Benefit Amount		
# of Transactions (7 days)	4.92	4.93
	3.83	3.84
# of Transactions (Month)	10.28	10.30
	7.14	7.16
Bulk Shopping (%)	43.06	42.99
	49.52	49.51
Benefit Amount ($)	351.69	352.02
	191.24	191.49
SNAP Tenure		
Tenure (Ben. Months)	35.35	35.38
	16.08	16.02
Households	918,481	91,848
Benefit Months	19,795,513	1,986,510

Note: The restricted sample consists of benefit months generated by households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month. Restricted subsample 1 refers to the benefit months generated by a 10% random sample of these households.

Table 8 (Cont'd): Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Restricted Sample and Restricted Subsample 1

	Restricted Sample	***Restricted Subsample 1***
Household Location		
Rural	15.12	15.14
	35.82	35.84
Urban	77.88	77.90
	41.50	41.49
Mixed	7.00	6.96
	25.52	25.44
Store Choice		
Supermarkets ($)	269.57	269.80
	173.94	174.36
Grocery ($)	15.40	15.54
	48.13	48.40
Convenience ($)	17.00	17.01
	41.11	41.01
Combination ($)	15.91	15.79
	36.97	36.86
Specialty Foods ($)	3.92	3.84
	19.73	19.57
Other ($)	4.39	4.45
	28.48	28.50
Households	918,481	91,848
Benefit Months	19,795,513	1,986,510

Note: The restricted sample consists of benefit months generated by households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month. Restricted subsample 1 refers to the benefit months generated by a 10% random sample of these households.

Table 9: Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main Sample and Restricted Subsample 2

	Main Sample	***Restricted Subsample 2***
Amount Spent		
$ Within 7 days	167.47	179.81
	150.23	133.14
% Within 7 days	59.72	58.66
	33.54	31.75
$ Within Month	261.69	291.82
	188.05	161.84
% Within Month	91.55	92.59
	18.44	16.68
Transactions & Benefit Amount		
# of Transactions (7 days)	4.31	4.41
	3.68	3.45
# of Transactions (Month)	8.76	9.30
	6.87	6.48
Bulk Shopping (%)	49.26	44.93
	49.99	49.74
Benefit Amount ($)	287.80	316.71
	198.00	168.49
SNAP Tenure		
Tenure (Ben. Months)	35.80	33.65
	15.80	6.13
Households	1,555,674	38,059
Benefit Months	34,770,457	1,238,555

Note: The main sample consists of benefit months generated by the Universe of SNAP participating households in Georgia. Restricted subsample 2 consists of benefit months generated by households who receive a minimum benefit of $100 or more in any given benefit month, spend at least 75% of their benefit in any given benefit month, spend 2 years or more in SNAP and their first recorded month of participation in the program is January 2012.

Table 9 (Cont'd): Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main Sample and Restricted Subsample 2

	Main Sample	***Restricted Subsample 2***
Household Location		
Rural	16.87	14.49
	37.45	35.20
Urban	75.88	78.07
	42.78	41.38
Mixed	7.26	7.44
	25.94	26.24
Store Choice		
Supermarkets ($)	215.83	243.26
	171.77	155.23
Grocery ($)	12.00	13.10
	41.42	41.58
Convenience ($)	13.75	13.25
	36.09	33.72
Combination ($)	13.40	14.53
	32.80	34.42
Specialty Foods ($)	3.27	2.95
	17.65	16.25
Other ($)	3.44	4.73
	24.57	28.90
Households	1,555,674	38,059
Benefit Months	34,770,457	1,238,555

Note: The main sample consists of benefit months generated by the Universe of SNAP participating households in Georgia. Restricted subsample 2 consists of benefit months generated by households who receive a minimum benefit of $100 or more in any given benefit month, spend at least 75% of their benefit in any given benefit month, spend 2 years or more in SNAP and their first recorded month of participation in the program is January 2012.

Table 10: Two-class Finite Mixture Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Subsample

	Main Subsample	2-Part Mixture	
		Group 1	Group 2
Log Credit	0.8602***	0.4517***	0.9235***
	(0.0025)	(0.0051)	(0.0007)
Transactions	0.0220***	0.0692***	-0.0104***
	(0.0002)	(0.0007)	(0.0001)
Bulk Shopping	0.5046***	-0.5364***	0.2743***
	(0.0021)	(0.0066)	(0.0010)
Log Grocery	0.0269***	0.0284***	0.0120***
	(0.0007)	(0.0027)	(0.0002)
Log Convenience	-0.0054***	0.0035	0.0086***
	(0.0008)	(0.0026)	(0.0002)
Log Combination	0.0062***	0.0384***	0.0023***
	(0.0007)	(0.0022)	(0.0002)
Log Specialty	0.0241***	0.0104***	0.0132***
	(0.0009)	(0.0037)	(0.0003)
Log Other Stores	0.0238***	0.0105**	0.0113***
	(0.0012)	(0.0043)	(0.0004)
Rural	0.0086	-0.0101	0.0036**
	(0.0065)	(0.0166)	(0.0018)
Mixed	0.0000	0.0095	-0.0039***
	(0.0044)	(0.0117)	(0.0012)
Period	-0.0023***	0.0033***	-0.0014***
	(0.0001)	(0.0002)	(0.0000)
R-squared	0.3271		
Mean (Y)	$167	$12	$147
Probability		23%	77%
Households	155,567		
Benefit Months	3,474,589		

Note: Regression and mixture employ correlated random effects models. The dependent variable in the regression and mixture is the log of dollars spent within the first 7 days of the benefit month. The main subsample column displays the results from a correlated random effects regression using a 10% random sample of all Georgia SNAP households during 2011 - 2015. Group 1 and 2 refer to the 2 part estimated classes from the mixture using the same 10% random sample. (*10%,**5%,***1%).

Table 11: Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Subsample

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Amount Spent				
$ Within 7 days	209.90	13.81	212.54	-198.72***
	(160.97)	(35.73)	(160.37)	
% Within 7 days	69.26	8.67	70.07	-61.40***
	(29.34)	(21.47)	(28.57)	
$ Within Month	291.31	125.65	293.54	-167.89***
	(196.92)	(133.18)	(196.69)	
% Within Month	92.95	80.29	93.12	-12.83***
	(16.72)	(29.32)	(16.42)	
Transactions & Benefit Amount				
# of Transactions (7 days)	5.23	0.65	5.29	-4.63***
	(3.91)	(1.41)	(3.89)	
# of Transactions (Month)	9.44	4.42	9.50	-5.08***
	(7.03)	(4.91)	(7.03)	
Bulk Shopping (%)	49.05	62.36	48.87	13.49***
	(49.99)	(48.45)	(49.99)	
Benefit Amount ($)	315.04	181.50	316.83	-135.32***
	(205.39)	(182.32)	(205.09)	
SNAP Tenure				
Tenure (Ben. Months)	38.13	15.67	38.43	-22.76***
	(15.39)	(17.24)	(15.13)	
Households	75,482	6,985	68,497	
Benefit Months	1,839,745	24,378	1,815,367	

Note: Using the finite mixture estimates, from the main subsample analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 155,567 households, in the main subsample, only 75,482 meet the above criteria. The classified households generate 1,839,745 benefit months. Of the 75,482 households, 6,985 belong to the slow spenders group and 68,497 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 11 (Cont'd): Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Main Subsample

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Household Location				
Rural	17.86	16.76	17.88	-1.12***
	(38.30)	(37.35)	(38.32)	
Urban	75.04	74.67	75.04	-0.37
	(43.28)	(43.49)	(43.28)	
Mixed	7.10	8.57	7.08	1.49***
	(25.69)	(28.00)	(25.65)	
Store Choice				
Supermarkets ($)	239.63	104.31	241.45	-137.14***
	(180.62)	(124.05)	(180.57)	
Grocery ($)	13.81	4.72	13.94	-9.21***
	(44.91)	(23.57)	(45.11)	
Convenience ($)	15.75	6.37	15.88	-9.51***
	(39.47)	(23.99)	(39.62)	
Combination ($)	14.54	6.80	14.64	-7.85***
	(34.29)	(21.67)	(34.41)	
Specialty Foods ($)	3.93	1.10	3.96	-2.87***
	(20.03)	(9.51)	(20.13)	
Other ($)	3.65	2.35	3.67	-1.32***
	(25.52)	(19.53)	(25.59)	
Households	75,482	6,985	68,497	
Benefit Months	1,839,745	24,378	1,815,367	

Note: Using the finite mixture estimates, from the main subsample analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 155,567 households, in the main subsample, only 75,482 meet the above criteria. The classified households generate 1,839,745 benefit months. Of the 75,482 households, 6,985 belong to the slow spenders group and 68,497 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 12: Two-class Finite Mixture Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 1

	Restricted Subsample 1	2-Part Mixture	
		Group 1	Group 2
Log Credit	0.7086***	0.2327***	0.9034***
	(0.0053)	(0.0149)	(0.0016)
Transactions	0.0173***	0.0694***	-0.0110***
	(0.0003)	(0.0009)	(0.0001)
Bulk Shopping	0.4343***	-0.5318***	0.2721***
	(0.0027)	(0.0099)	(0.0011)
Log Grocery	0.0235***	0.0223***	0.0116***
	(0.0009)	(0.0036)	(0.0003)
Log Convenience	-0.0046***	-0.0015	0.0086***
	(0.0010)	(0.0035)	(0.0003)
Log Combination	0.0009	0.0222***	0.0017***
	(0.0008)	(0.0031)	(0.0002)
Log Specialty	0.0185***	-0.0095*	0.0122***
	(0.0011)	(0.0051)	(0.0003)
Log Other Stores	0.0228***	0.0250***	0.0109***
	(0.0015)	(0.0058)	(0.0004)
Rural	0.0118	-0.0017	0.0053**
	(0.0087)	(0.0282)	(0.0025)
Mixed	-0.0155***	-0.0153	-0.0011
	(0.0059)	(0.0189)	(0.0016)
Period	-0.0017***	0.0053***	-0.0015***
	(0.0001)	(0.0004)	(0.0000)
R-squared	0.1780		
Mean (Y)	$123	$15	$200
Probability		18%	82%
Households	91,848		
Benefit Months	1,986,510		

Note: Regression and mixture employ correlated random effects models. The dependent variable in the regression and mixture is the log of dollars spent within the first 7 days of the benefit month. The restricted subsample 1 column displays the results from a correlated random effects regression using a 10% random sample of households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month. Group 1 and 2 refer to the 2 part estimated classes from the mixture using the same 10% random sample. (*10%,**5%,***1%).

Table 13: Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 1

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Amount Spent				
$ Within 7 days	240.04	12.79	241.05	-228.26***
	(161.43)	(36.42)	(161.06)	
% Within 7 days	66.61	5.51	66.88	-61.37***
	(28.64)	(15.88)	(28.39)	
$ Within Month	345.89	233.43	346.39	-112.96***
	(191.33)	(138.56)	(191.38)	
% Within Month	93.54	94.31	93.54	0.77***
	(15.55)	(12.37)	(15.57)	
Transactions & Benefit Amount				
# of Transactions (7 days)	5.67	0.49	5.69	-5.20***
	(3.98)	(1.16)	(3.97)	
# of Transactions (Month)	10.84	6.59	10.86	-4.28***
	(7.31)	(5.59)	(7.31)	
Bulk Shopping (%)	42.53	65.42	42.43	22.99***
	(49.44)	(47.57)	(49.42)	
Benefit Amount ($)	371.14	248.77	371.68	-122.91***
	(197.12)	(146.23)	(197.14)	
SNAP Tenure				
Tenure (Ben. Months)	37.60	5.96	37.74	-31.78***
	(15.45)	(10.19)	(15.32)	
Households	54,732	3,329	51,403	
Benefit Months	1,318,749	5,844	1,312,905	

Note: Using the finite mixture estimates, from the restricted subsample 1 analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 91,848 households, in restricted subsample 1, only 54,732 meet the above criteria. The classified households generate 1,318,749 benefit months. Of the 54,732 households, 3,329 belong to the slow spenders group and 51,403 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 13 (Cont'd): Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 1

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Household Location				
Rural	16.26	10.61	16.28	-5.67***
	(36.90)	(30.80)	(36.92)	
Urban	76.90	81.52	76.88	4.64***
	(42.15)	(38.82)	(42.16)	
Mixed	6.85	7.87	6.84	1.03**
	(25.26)	(26.93)	(25.25)	
Store Choice				
Supermarkets ($)	284.89	192.83	285.30	-92.47***
	(180.48)	(136.21)	(180.55)	
Grocery ($)	16.83	8.12	16.87	-8.74***
	(50.96)	(35.35)	(51.01)	
Convenience ($)	18.74	13.15	18.76	-5.61***
	(43.60)	(38.84)	(43.62)	
Combination ($)	16.65	10.82	16.68	-5.86***
	(37.47)	(32.44)	(37.49)	
Specialty Foods ($)	4.34	1.87	4.35	-2.48***
	(21.18)	(12.94)	(21.21)	
Other ($)	4.44	6.64	4.43	2.20***
	(28.70)	(39.62)	(28.64)	
Households	54,732	3,329	51,403	
Benefit Months	1,318,749	5,844	1,312,905	

Note: Using the finite mixture estimates, from the restricted subsample 1 analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 91,848 households, in restricted subsample 1, only 54,732 meet the above criteria. The classified households generate 1,318,749 benefit months. Of the 54,732 households, 3,329 belong to the slow spenders group and 51,403 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 14: Two-class Finite Mixture Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 2

	Restricted Subsample 2	2-Part Mixture	
		Group 1	Group 2
Log Credit	0.6505***	0.2660***	0.8692***
	(0.0070)	(0.0186)	(0.0022)
Transactions	0.0229***	0.0774***	-0.0110***
	(0.0004)	(0.0012)	(0.0001)
Bulk Shopping	0.4907***	-0.4154***	0.2980***
	(0.0034)	(0.0117)	(0.0014)
Log Grocery	0.0256***	0.0256***	0.0114***
	(0.0012)	(0.0047)	(0.0004)
Log Convenience	-0.0136***	-0.0010	0.0077***
	(0.0013)	(0.0047)	(0.0004)
Log Combination	0.0027**	0.0351***	0.0031***
	(0.0011)	(0.0038)	(0.0003)
Log Specialty	0.0193***	-0.0073	0.0135***
	(0.0016)	(0.0068)	(0.0005)
Log Other Stores	0.0216***	0.0156**	0.0114***
	(0.0019)	(0.0068)	(0.0006)
Rural	0.0132	0.0103	0.0014
	(0.0116)	(0.0352)	(0.0033)
Mixed	-0.0136*	-0.0130	0.0002
	(0.0073)	(0.0230)	(0.0021)
Period	0.0102***	0.0369***	-0.0002***
	(0.0002)	(0.0005)	(0.0000)
R-squared	0.1412		
Mean (Y)	$109	$13	$179
Probability		19%	81%
Households	38,059		
Benefit Months	1,238,555		

Note: Regression and mixture employ correlated random effects models. The dependent variable in both is the log of dollars spent within the first 7 days of the benefit month. The restricted subsample 2 column displays the results of a regression using benefit months generated by households who receive a minimum benefit of $100 or more, spend at least 75% of their benefit in any given benefit month, spend 2 years or more in SNAP and their first recorded month of participation in the program is January 2012. Group 1 and 2 refer to the 2 part estimated classes from the mixture using the same subsample. (*10%,**5%,***1%).

Table 15: Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 2

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Amount Spent				
$ Within 7 days	206.59	22.52	206.81	-184.29***
	(136.19)	(50.52)	(136.11)	
% Within 7 days	65.53	11.06	65.60	-54.54***
	(29.20)	(24.30)	(29.14)	
$ Within Month	303.89	182.93	304.03	-121.11***
	(166.73)	(66.98)	(166.76)	
% Within Month	93.04	93.52	93.04	0.48
	(16.26)	(15.62)	(16.26)	
Transactions & Benefit Amount				
# of Transactions (7 days)	5.08	0.71	5.08	-4.38***
	(3.60)	(1.19)	(3.60)	
# of Transactions (Month)	9.77	3.84	9.78	-5.94***
	(6.60)	(2.91)	(6.60)	
Bulk Shopping (%)	44.74	83.39	44.70	38.69***
	(49.72)	(37.24)	(49.72)	
Benefit Amount ($)	328.01	197.82	328.17	-130.34***
	(172.69)	(72.45)	(172.72)	
SNAP Tenure				
Tenure (Ben. Months)	34.03	33.25	34.03	-0.79***
	(6.24)	(6.08)	(6.24)	
Households	24,111	29	24,082	
Benefit Months	792,816	933	791,883	

Note: Using the finite mixture estimates, from the restricted subsample 2 analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 38,059 households, in restricted subsample 2, only 24,111 meet the above criteria. The classified households generate 792,816 benefit months. Of the 24,111 households, 29 belong to the slow spenders group and 24,082 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 15 (Cont'd): Comparing Characteristics Across the Groups, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 2

	Classified Households	***Group 1 Slow***	***Group 2 Fast***	**Diff.**
Household Location				
Rural	15.39	5.79	15.40	-9.61***
	(36.09)	(23.36)	(36.10)	
Urban	77.24	89.17	77.23	11.95***
	(41.93)	(31.09)	(41.94)	
Mixed	7.37	5.04	7.37	-2.33**
	(26.12)	(21.88)	(26.13)	
Store Choice				
Supermarkets ($)	252.32	163.25	252.43	-89.18***
	(160.04)	(71.72)	(160.09)	
Grocery ($)	13.85	4.88	13.86	-8.98***
	(43.24)	(23.19)	(43.25)	
Convenience ($)	14.69	3.31	14.70	-11.40***
	(35.64)	(12.49)	(35.65)	
Combination ($)	14.98	9.64	14.98	-5.34***
	(34.23)	(35.29)	(34.23)	
Specialty Foods ($)	3.28	0.32	3.28	-2.96***
	(17.34)	(3.96)	(17.35)	
Other ($)	4.78	1.53	4.78	-3.26***
	(29.19)	(16.17)	(29.20)	
Households	24,111	29	24,082	
Benefit Months	792,816	933	791,883	

Note: Using the finite mixture estimates, from the restricted subsample 2 analysis, I calculate the posterior probabilities of households belonging to group 1 (slow spenders) or group 2 (fast spenders). With these posterior probabilities, I classify a household either as a slow spender (Pr("Slow")$\geq$.80) or fast spender (Pr("Slow")$<$.20). Out of 38,059 households, in restricted subsample 2, only 24,111 meet the above criteria. The classified households generate 792,816 benefit months. Of the 24,111 households, 29 belong to the slow spenders group and 24,082 belong to the fast spenders group. Diff. refers to the difference in means between slow and fast spenders.

Table 16: Constructed Store Categories, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program

Supermarkets	Grocery	Convenience	Combination	Specialty	Other
Walmart	Sai Fresh Foods	Quiktrip	Dollar General	Peacock Meats	Twenterprise
Kroger	Soonoco Friends	Quick Mart	Race Trac	Sweet Thangs Bakery	Country Fresh Foods
Publix	King Food Mart	Citgo Quick Service	Dollar Tree	Crab King II	Dyans Food
Aldi	Family Food Market	Chevron Food Mart	Walgreens	Butcher boyz	USA Best Choice
Target	Twin City Grocery	Stop N Save	Rite Aid	Rocky Creek Seafood	Temple Seafood
Piggly Wiggly	Harvest Time Market	Exxon Food Mart	K.D. Asian Market	Tucker Farmers Market	Plantation Meats
Food Depot	Barkers Market	Quick Stop	Fred's Store	Anytime Bread	Massey Foods
Food Lion	Snipes Fine Foods	Petro Gas Station	CVS	Cajun Meat Company	The Steak Man
Sam's Club	Gaskins Grocery	Shell Food Mart	Ideal Tropical Foods	Red Barn Produce	Simpson Meats
Ingles	Dublin Foods 30	Circle K Store	Family Dollar Store	Fatboys Produce	Anthonys Store

Notes: Non-exhaustive list detailing some of the individual stores that belong to each constructed store category. These categories are derived from the USDA Store Tracking and Redemption System (STARS). Supermarkets refers to stores that sell a wide variety of grocery and other store merchandise, and have multiple checkout lanes and registers. This category includes STARS supermarkets, superstores and military commissaries. Grocery stores refers to stores that carry a small, moderate, or wide selection of all four staple food categories, with their primary stock being food items. This category includes STARS small, medium and large grocery stores. Convenience refers to self-service stores that offer a limited line of convenience items and primarily sell a variety of canned goods, dairy products, pre-packaged meats and other grocery items in limited amounts. This category is identical to the STARS convenience category. Combination refers to stores where the primary business is the sale of general merchandise but also sell a variety of food products. This category includes dollar stores, drug stores, and general stores. This category is identical to the STARS combination grocery/other stores category. Specialty foods refers to stores that operate as a cooperative or specialize in the sale of specific products such as bread/cereal products, fruits and/or vegetable products, meat products, and seafood products. Finally, Other refers to all remaining stores in the data that do not fit neatly into any of the above categories.

Table 17: Linear Probability Model Estimates, Covariates Affecting Probability of Assignment, Classified Households (Main Subsample)

	(1)
Total Credit	-0.0011***
	(0.0001)
Transactions	0.0022***
	(0.0000)
Bulk Shopper	-0.0041***
	(0.0002)
Rural	-0.0025***
	(0.0002)
Mixed	-0.0024***
	(0.0003)
Grocery	-0.0174***
	(0.0006)
Convenience	-0.0244***
	(0.0009)
Combination	-0.0571***
	(0.0009)
Specialty	-0.0570***
	(0.0040)
Other Stores	-0.0204***
	(0.0013)
Tenure	0.0012***
	(0.0000)
R-squared	0.0416
Households	75,482
Benefit Months	1,839,745

The sample used is the classified sample obtained from the mixture analysis using the main subsample. Of the 75,482 households in the sample, 6,985 belong to the slow spenders group and 68,497 belong to the fast spenders group. The dependent variable is a binary indicator identifying households who are fast spenders. The classified households generate 1,839,745 benefit months. (*10%,**5%,***1%).

APPENDIX

Table A.1: Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Benefit Size

	Main Sample	***BA<$100***	***BA∈[$100,$250]***	**BA>$250**	***P-value***	***1 vs 2***	***2 vs 3***	***1 vs 3***
Amount Spent								
$ Within 7 days	167.47	21.97	109.96	295.14	0.0000	-87.99***	-185.18***	-273.17***
	(150.23)	(23.03)	(66.71)	(187.85)				
% Within 7 days	59.72	58.77	59.92	56.04	0.0000	-1.15***	3.88***	2.74***
	(33.54)	(42.25)	(35.02)	(29.45)				
$ Within Month	261.69	33.79	167.63	476.85	0.0000	-133.84***	-309.22***	-443.05***
	(188.05)	(23.71)	(43.73)	(183.95)				
% Within Month	91.55	93.38	91.47	90.69	0.0000	1.91***	0.78***	2.69***
	(18.44)	(15.99)	(19.21)	(18.51)				
Transactions & Benefit Amount								
# of Transactions (7 days)	4.31	1.39	3.65	5.90	0.0000	-2.26***	-2.25***	-4.51***
	(3.68)	(1.51)	(3.14)	(4.20)				
# of Transactions (Month)	8.76	2.47	7.07	12.90	0.0000	-4.61***	-5.83***	-10.43***
	(6.87)	(2.10)	(5.20)	(7.70)				
Bulk Shopping (%)	49.26	85.42	55.82	29.20	0.0000	29.60***	26.62***	56.22***
	(49.99)	(35.29)	(49.66)	(45.47)				
Benefit Amount ($)	287.80	36.35	183.30	527.68	0.0000	-146.95***	-344.39***	-491.33***
	(198.00)	(24.36)	(27.80)	(176.14)				
SNAP Tenure								
Tenure (Ben. Months)	35.80	32.66	27.43	36.68	0.0000	5.23***	-9.25***	-4.02***
	(15.80)	(17.42)	(17.75)	(16.54)				
Households	1,555,674	104,109	332,444	312,193				
Benefit Months	34,770,457	1,730,014	4,279,901	6,419,025				

Note: Main sample and breakdown by benefit size. BA represents benefit amount. Three groups are displayed: households whose maximum benefit amount received in any benefit month is less than $100, households who receive a minimum benefit of $100 and a maximum benefit of $250 inclusive, and households whose minimum benefit amount received in any benefit month is greater than $250. P-value for F test of joint difference in means across all three groups is displayed. Pairwise t-tests for difference of means are also displayed. 1 vs 2 refers to the first group means compared to the second group means (BA<$100 vs BA∈[$100,$250]). The remaining comparisons are interpreted analogously. The benefit categories are mutually exclusive, but are not collectively exhaustive. For example, households who receive a minimum of $100 and a maximum benefit greater than $250 are not represented in these categories.

Table A.1 (Cont'd): Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Benefit Size

	Main Sample	*BA<$100*	*BA∈[$100,$250]*	**BA>$250**	*P-value*	*1 vs 2*	*2 vs 3*	*1 vs 3*
Household Location								
Rural	16.87	24.73	14.83	14.88	0.0000	9.90***	-0.05*	9.85***
	(37.45)	(43.14)	(35.54)	(35.59)				
Urban	75.88	67.67	77.75	78.46	0.0000	-10.08***	-0.70***	-10.79***
	(42.78)	(46.77)	(41.59)	(41.11)				
Mixed	7.26	7.60	7.42	6.66	0.0000	0.18***	0.76***	0.94***
	(25.94)	(26.50)	(26.21)	(24.94)				
Store Choice								
Supermarkets ($)	215.83	27.13	135.54	396.01	0.0000	-108.41***	-260.47***	-368.88***
	(171.77)	(23.54)	(58.26)	(184.56)				
Grocery ($)	12.00	1.73	7.40	23.41	0.0000	-5.67***	-16.01***	-21.68***
	(41.42)	(7.73)	(25.20)	(64.59)				
Convenience ($)	13.75	1.42	10.89	22.86	0.0000	-9.47***	-11.97***	-21.44***
	(36.09)	(5.81)	(26.40)	(52.82)				
Combination ($)	13.40	2.74	9.38	22.04	0.0000	-6.64***	-12.66***	-19.30***
	(32.80)	(7.94)	(22.24)	(47.59)				
Specialty Foods ($)	3.27	0.41	2.20	5.74	0.0000	-1.79***	-3.54***	-5.34***
	(17.65)	(3.23)	(11.57)	(26.36)				
Other ($)	3.44	0.37	2.22	6.80	0.0000	-1.85***	-4.58***	-6.43***
	(24.57)	(3.71)	(15.31)	(38.87)				
Households	1,555,674	104,109	332,444	312,193				
Benefit Months	34,770,457	1,730,014	4,279,901	6,419,025				

Note: Main sample and breakdown by benefit size. BA represents benefit amount. Three groups are displayed: households whose maximum benefit amount received in any benefit month is less than $100, households who receive a minimum benefit of $100 and a maximum of $250 inclusive, and households whose minimum benefit amount received in any benefit month is greater than $250. P-value for F test of joint difference in means across all three groups is displayed. Pairwise t-tests for difference of means are also displayed. 1 vs 2 refers to the first group means compared to the second group means (BA<$100 vs BA∈[$100,$250]). The remaining comparisons are interpreted analogously. The benefit categories are mutually exclusive, but are not collectively exhaustive. For example, households who receive a minimum of $100 and a maximum benefit greater than $250 are not represented in these categories.

Table A.2: Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Tenure

	Main Sample	***T≤12***	***T∈(12,24)***	**T≥24**	***P-value***	***1 vs 2***	***2 vs 3***	***1 vs 3***
Amount Spent								
$ Within 7 days	167.47	119.65	140.13	180.02	0.0000	-20.48***	-39.89***	-60.37***
	(150.23)	(115.03)	(123.11)	(157.43)				
% Within 7 days	59.72	51.53	56.49	61.58	0.0000	-4.96***	-5.09***	-10.04***
	(33.54)	(36.22)	(34.39)	(32.71)				
$ Within Month	261.69	220.00	235.96	273.01	0.0000	-15.96***	-37.05***	-53.01***
	(188.05)	(156.61)	(164.16)	(195.26)				
% Within Month	91.55	90.50	91.39	91.74	0.0000	-0.90***	-0.34***	-1.24***
	(18.44)	(19.61)	(18.60)	(18.23)				
Transactions & Benefit Amount								
# of Transactions (7 days)	4.31	3.33	3.85	4.55	0.0000	-0.52***	-0.70***	-1.22***
	(3.68)	(3.24)	(3.39)	(3.77)				
# of Transactions (Month)	8.76	7.72	8.30	9.01	0.0000	-0.58***	-0.71***	-1.29***
	(6.87)	(6.20)	(6.53)	(7.01)				
Bulk Shopping (%)	49.26	51.70	50.28	48.69	0.0000	1.42***	1.59***	3.01***
	(49.99)	(49.97)	(50.00)	(49.98)				
Benefit Amount ($)	287.80	246.06	260.19	299.49	0.0000	-14.13***	-39.30***	-53.43***
	(198.00)	(167.97)	(173.42)	(205.19)				
SNAP Tenure								
Tenure (Ben. Months)	35.80	7.93	18.28	43.42	0.0000	-10.35***	-25.14***	-35.49***
	(15.80)	(3.02)	(3.08)	(9.90)				
Households	1,555,674	636,521	287,162	631,991				
Benefit Months	34,770,457	3,861,033	5,094,561	25,814,863				

Note: Main sample and breakdown by length of participation in SNAP. Length of participation in SNAP is measured by tenure (T), the number of benefit months a households spends in the program. Three groups are displayed: households whose tenure in SNAP is less or equal to 12 benefit months (a year or less), between 12 and 24 benefit months exclusive (more than a 1 year and less than 2 years), and greater or equal to 24 benefit months (2 years or more). P-value for F test of joint difference in means across all three groups is displayed. Pairwise t-tests for difference of means are also displayed. 1 vs 2 refers to the first group means compared to the second group means (T<12 vs T∈(12,24)). The remaining comparisons are interpreted analogously. The tenure categories are mutually exclusive and collectively exhaustive.

Table A.2 (Cont'd): Summary Statistics, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program (SNAP) households, Main sample and by Tenure

	Main Sample	***T≤12***	***T∈(12,24)***	**T≥24**	***P-value***	***1 vs 2***	***2 vs 3***	***1 vs 3***
Household Location								
Rural	16.87 (37.45)	13.24 (33.89)	14.57 (35.28)	17.86 (38.30)	0.0000	-1.33***	-3.29***	-4.62***
Urban	75.88 (42.78)	79.44 (40.41)	78.16 (41.32)	74.90 (43.36)	0.0000	1.29***	3.26***	4.55***
Mixed	7.26 (25.94)	7.32 (26.04)	7.27 (25.97)	7.24 (25.92)	0.0000	0.05**	0.03*	0.08***
Store Choice								
Supermarkets ($)	215.83 (171.77)	186.76 (148.83)	198.60 (154.71)	223.58 (177.37)	0.0000	-11.84***	-24.97***	-36.82***
Grocery ($)	12.00 (41.42)	7.32 (30.64)	8.64 (33.39)	13.36 (44.08)	0.0000	-1.33***	-4.72***	-6.05***
Convenience ($)	13.75 (36.09)	10.76 (29.68)	11.92 (31.58)	14.56 (37.72)	0.0000	-1.16***	-2.64***	-3.80***
Combination ($)	13.40 (32.80)	10.00 (27.31)	11.28 (29.03)	14.33 (34.17)	0.0000	-1.27***	-3.06***	-4.33***
Specialty Foods ($)	3.27 (17.65)	2.06 (12.95)	2.38 (13.92)	3.63 (18.86)	0.0000	-0.32***	-1.25***	-1.57***
Other ($)	3.44 (24.57)	3.11 (23.21)	3.14 (23.14)	3.55 (25.03)	0.0000	-0.03	-0.42***	-0.45***
Households	1,555,674	636,521	287,162	631,991				
Benefit Months	34,770,457	3,861,033	5,094,561	25,814,863				

Note: Main sample and breakdown by length of participation in SNAP. Length of participation in SNAP is measured by tenure (T), the number of benefit months a households spends in the program. Three groups are displayed: households whose tenure in SNAP is less or equal to 12 benefit months (a year or less), between 12 and 24 benefit months exclusive (more than a 1 year and less than 2 years), and greater or equal to 24 benefit months (2 years or more). P-value for F test of joint difference in means across all three groups is displayed. Pairwise t-tests for difference of means are also displayed. 1 vs 2 refers to the first group means compared to the second group means (T<12 vs T∈(12,24)). The remaining comparisons are interpreted analogously. The tenure categories are mutually exclusive and collectively exhaustive.

Table A.3: Three-class Finite Mixture Estimates, 2011 - 2015 Georgia Supplemental Nutrition Assistance Program Households, Restricted Subsample 1

	Restricted Subsample 1	3-Part Mixture		
		Group 1	Group 2	Group 3
Log Credit	0.7086***	0.2090***	0.8976***	0.9960***
	(0.0053)	(0.0151)	(0.0018)	(0.0000)
Transactions	0.0173***	0.0743***	-0.0071***	-0.0000***
	(0.0003)	(0.0009)	(0.0001)	(0.0000)
Bulk Shopping	0.4343***	-0.5217***	0.2865***	-0.0001***
	(0.0027)	(0.0099)	(0.0010)	(0.0000)
Log Grocery	0.0235***	0.0201***	0.0119***	-0.0000
	(0.0009)	(0.0037)	(0.0003)	(0.0000)
Log Convenience	-0.0046***	0.0027	0.0092***	-0.0000
	(0.0010)	(0.0036)	(0.0003)	(0.0000)
Log Combination	0.0009	0.0287***	0.0037***	-0.0000
	(0.0008)	(0.0032)	(0.0003)	(0.0000)
Log Specialty	0.0185***	-0.0134**	0.0124***	0.0000
	(0.0011)	(0.0053)	(0.0004)	(0.0000)
Log Other Stores	0.0228***	0.0241***	0.0115***	0.0000
	(0.0015)	(0.0060)	(0.0005)	(0.0000)
Rural	0.0118	-0.0159	0.0010	0.0000
	(0.0087)	(0.0287)	(0.0029)	(0.0000)
Mixed	-0.0155***	-0.0252	-0.0066***	-0.0000
	(0.0059)	(0.0191)	(0.0018)	(0.0000)
Period	-0.0017***	0.0059***	-0.0016***	0.0000***
	(0.0001)	(0.0004)	(0.0000)	(0.0000)
R-squared	0.1780			
Mean (Y)	$123	$13	$191	$308
Probability		17%	74%	9%
Households	91,848			
Benefit Months	1,986,510			

Regression and mixture employ correlated random effects models. The dependent variable in the regression and mixture is the log of dollars spent within the first 7 days of the benefit month. The restricted subsample 1 column displays the results from a correlated random effects regression using a 10% random sample of households who receive a minimum benefit of $100 dollars or more and spend at least 75% of their benefit in any given benefit month. Group 1, 2, and 3 refer to the 3 part estimated classes from the mixture using the same 10% random sample. (*10%,**5%,***1%).