Electronic Benefit Transfer and Food Expenditure Cycles *

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Abstract

Previous research shows that the way transfer income is disbursed can affect what households purchase with that income. In this paper, I provide evidence that disbursement technique can affect the *timing* of purchases as well. I examine the U.S. Supplemental Nutrition Assistance Program (SNAP), which switched on a state-by-state basis from cash-similar food coupons to Electronic Benefit Transfer (EBT) –a secure debit card– from 1993-2004. I find that EBT mitigated boom-and-bust cycles in food spending associated with SNAP disbursement. This effect is entirely driven by households with children (about two-thirds of the SNAP population), who experienced more severe cycles prior to EBT. The effect operates only through the intensive margin –the amount spent on food during a shopping trip– and not at all on the extensive margin –the likelihood of going food shopping.

JEL Classifications: I38, D14

Keywords: SNAP; Electronic benefits; Food expenditure

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1 Introduction

> My food stamps are depleted after maybe two and a half weeks. That's when our cupboards become bare and there isn't anything left in the deep freezer. I start to worry about where our next meal is coming from.
>
> –Tiffany, mother of three (Narula et al. 2013, p. 20)

Many households receiving food assistance do not smooth their expenditure and consumption between benefit disbursement dates. In the U.S., food spending and calories consumed jump upon SNAP (Supplemental Nutrition Assistance Program) benefit disbursement and then decay over the course of the benefit month. This pattern is well documented (Wilde & Ranney, 2000; Shapiro, 2005; Hastings & Washington, 2010; Castner & Henke, 2011; Damon et al., 2013; Todd, 2015; Smith et al., 2016; Hamrick & Andrews, 2016; Kuhn, 2018; Goldin et al., 2019). Behavior also fluctuates with the SNAP cycle: as the benefit month goes on and resources dry up, Carr & Packham (2018) find that theft increases (in the last week of the month), Gennetian et al. (2016) find that children are more likely to misbehave in school, and Cotti et al. (2017) find that children's test scores are lower.[1]

In this paper, I study the impact of the introduction of Electronic Benefit Transfer (EBT) on the food expenditure cycles of SNAP participants. EBT is a replacement for cash-similar SNAP coupons (literal 'food stamps'). Two perceived issues with SNAP prior to the implementation of EBT were the stigma associated with identifiable coupons and the potential for fraud through resale. EBT cards addressed both of these issues to some degree. They work and look like standard debit cards, with a Personal Identification Number (PIN) required for use. PINs can be changed

[1]Other transfer programs create cycles in drug use (Dobkin & Puller, 2007), domestic violence (Hsu, 2017), and crime (Foley, 2011).

with minimal transaction cost.[2] Benefits are loaded onto the card-holder's account on a monthly frequency, but the calendar day of monthly disbursement typically varies across households.[3] A household's card is issued to the primary benefit recipient.[4] Therefore, in addition to affecting stigma and security, EBT gave the primary recipient more control –or at least the option of more control– over their benefits. During the roughly twelve-year rollout period of EBT from 1993 to 2004, about 22 million Americans were in households that experienced this change, slightly over half of which were children.[5]

I find that EBT led to less severe expenditure cycles among households with children. If expenditure cycles inform consumption cycles, this suggests that electronic payments may result in better budgeting and consumption-smoothing outcomes than cash or cash-similar payments.[6] Beyond helping economists better understand the fundamentals of dynamic collective spending behavior, my findings have the following implications for public policy. First, they suggest that EBT cards featuring photo identification could be valuable to some households. There is an ongoing policy debate about whether to require photo identification on EBT cards. As of writing, Massachusetts is the only state requiring photos on EBT cards, but many states have either implemented and then repealed, or proposed legislation to add photos (Mills & Lowenstein, 2015).[7] While evidence sug-

[2]Either a phone call or –more recently– a visit to the state EBT website.

[3]This variation is both across-state and within-state.

[4]The primary recipient is the individual that fills out an application (in most states, this can now be done online, but it can still be done by mail or in person) and participates in the follow-up interview (either by phone or in person). In some states, second cards can be obtained with the permission of the primary recipient.

[5]This is average participation during the rollout (https://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap) combined with USDA reports on the characteristics of participants (e.g. https://www.fns.usda.gov/snap/characteristics-food-stamp-households-fiscal-year-2004.

[6]This issue is discussed in detail in Section 3.3.

[7]Federal law requires that any household member be permitted to use SNAP benefits without being asked to show ID besides the EBT card, but this does not prevent states from requiring a photo of the primary recipient on the card. In 2016, the USDA issued Food and Nutrition Service Rule 81 FR 89831 to update and clarify this regulation in response to states considering new requirements.

gests there is very little fraud that could be prevented by photo-EBT (Mills & Lowenstein, 2015), the effect of EBT I identify suggests that some households could also experience expenditure-smoothing benefits from photo-EBT. This is because photo-EBT further enhances the shift from fungible, cash-similar coupons to an individually-controlled account. An optional photo-EBT policy could provide primary recipients this value without forcing them to experience stigma.

Second, my results suggest that the relationship between disbursement technique and spending dynamics is a potential policy lever in a wide variety of settings beyond SNAP. Section 4.2 reviews the literature on disbursement techniques for income and transfers, which shows that techniques matter for static outcomes in a wide variety of contexts. This paper extends those findings to spending dynamics. Cash transfer programs may arrive publicly or privately, or to shared or individual accounts, depending on the household. In a variety of settings, including Unemployment Insurance, the Earned Income Tax Credit (EITC), stimulus payments, and general income disbursement, my findings suggest that switching a household to digital payments, or changing account ownership has the potential to affect spending dynamics. Especially when the disbursement frequency of a payment is low, the issue of smoothing is paramount. Households have preferences over spending dynamics (and other aspects of disbursement technique), yet the recent literature on take-up (e.g. Bhargava & Manoli (2015); Finkelstein & Notowidigdo (2019); Deshpande & Li (2019)) has not focused on disbursement technique as a potential factor explaining lower-than-expected program participation.

Third, my results suggest that additional policy interventions to reduce cyclicality in non-durable spending may be welfare-improving. I find that households with extreme cycles moderate them –to look more like other households– in response to getting a new tool. This suggests that households prefer smoother expenditures to extreme cycles. In addition to recent work showing that expenditure and consumption cycles are correlated (Kuhn, 2018), this builds a case for intervention –or at least more detailed study– when data show highly cyclical spending on non-durables.

While there is a literature that examines the impact of EBT on SNAP enrollment, there is surprisingly little other work on the other effects of such a large program overhaul.[8] One reason that some economists may have overlooked EBT is that it represented no change to the budget constraint or food preferences that enter an individual utility maximization problem. However, there are a number of reasons to expect that EBT could have affected SNAP use. If EBT reduced stigma from using SNAP publicly, the fixed costs of going shopping were likely reduced. If EBT made benefits more secure, saving them likely became less risky. If EBT made benefit arrival less salient, households likely became less sensitive to the SNAP cycle. If EBT changed the ownership of benefits within the household by empowering the primary recipient, it could have changed how differing food and time preferences across individuals within a household were expressed.

To study the impact of EBT, I use 1994-2003 Consumer Expenditure Survey (CES) diary data to observe two weeks of a household's food expenditures. I then leverage the staggered rollout of the (mostly) mandatory EBT program across states in a generalized difference-in-difference-in-trends design, where a diff-in-diff design is implemented within a model of spending trends over the benefit month. The data and methodology are explained in Section 2, and the main results are presented in Section 3. I find that before EBT, households with children experienced more extreme expenditure cycles than households without children. EBT eliminated this difference by causing a large reallocation of spending from the first week of the benefit month to later weeks among

[8]Results from this literature are mixed: Atasoy et al. (2010) find a decrease in enrollment, Currie & Grogger (2001), Kornfeld (2002), Kabbani & Wilde (2003), Danielson & Klerman (2006) and Kaushal & Gao (2011) find an increase and Ziliak et al. (2000), McKernan & Ratcliffe (2003) and Bednar (2011) find no impact. Beyond examining SNAP participation, Wright et al. (2017) find that the implementation of EBT in Missouri had a negative impact on crime rates.

households with children.[9] For example, for a single parent household with two children, food expenditure during a shopping trip in the second, third, or fourth week of the benefit month nearly doubled when EBT was implemented (up $22 from a baseline of $29), and was much lower in the first week ($27 from a baseline of $80).[10] Results are robust to the inclusion of state and year fixed effects, state-specific linear time trends, and an event-study style approach that focuses on a smaller window around each state's EBT implementation. A range of robustness tests are offered in Section 3.2, and a demonstration that pre-EBT consumption trend heterogeneity matches pre-EBT expenditure trend heterogeneity is in Section 3.3.

I offer tests of competing mechanisms for the impact of EBT in Section 4. A puzzling feature of the results that casts doubt on a variety of explanations, including stigma, security, salience, and benefit ownership, is that the effect of EBT is limited to the intensive, rather than extensive, margin: I find no effect of EBT on when people go food shopping. Instead, the results show a reallocation of funds across a fixed shopping schedule. I explore whether the evidence is consistent with a version of the benefit-ownership mechanism that does not require a change in the shopping schedule, and obtain mixed results. The application of this type of model to the timing of household spending –a dynamic take on Lundberg et al. (1997) wherein benefit ownership affects *when* instead of *what* people buy– is itself novel, but further research is needed to assess its role in explaining expenditure and consumption cycles.[11]

[9]This is consistent with Todd (2015), who finds that in more recent data with EBT fully implemented, households with and without children experience similar diet cycles.

[10]All amounts in 2017 $. The probability of shopping is higher during week one (and is not impacted by EBT), which balances the budget.

[11]Especially in the low-income and developing context, a number of studies indicate different expenditure behaviors, depending on income recipient identity. Examples include Browning et al. (1994), Browning & Chiappori (1999), Duflo (2003), Bobonis (2009), Attanasio & Lechene (2014), Attanasio et al. (2012) and Wang (2014).

2 Data and Methodology

2.1 CES Data

The Consumer Expenditure Survey (CES) diaries are published by the U.S. Bureau of Labor Statistics. These are self-reported expenditure logs that cover 14 consecutive days for each participating household. They are collected every year, all throughout the year, and consist of two back-to-back, week-long logs formatted to keep item-specific records of all purchases. The diaries are linked to a broader, one-time survey of households. Item-level data are coded with a Universal Classification Code (UCC), which identifies expenditures on narrow food categories. Purchases are not coded as individual-specific.

The usable set of CES diaries for SNAP-recipient households ranges from 1994 to 2003; prior to and following this period, the CES did not ask for the exact date of the most recent SNAP disbursement. Household i is observed over 14 consecutive diary days, j. j is transformed into a variable that indicates the number of days since the last SNAP disbursement, t, with $t = 0$ on the exact date of reported arrival. For example, if $t = 0$ corresponds to $j = 1$ for a particular household, all 14 days of the diary are used as the first two weeks of expenditures. Panel A of Figure 1 shows the time path of mean household SNAP-*eligible* food expenditure –not SNAP expenditure– (measured in 2017 \$) of the course of the benefit month.[12] There is large spike on the day of disbursement, however, the fitted value plots show that the estimated negative trend is robust to excluding that point. Average food expenditures on the day of SNAP disbursement ($t = 0$) are \$35.87 (\$82.66, conditional on shopping, with 44% of households shopping). After four weeks, expenditures decline to \$9.26 per-day on average (\$29.08, conditional on shopping, with 33% of

[12]SNAP-eligible items include all food items, excluding alcohol, and prepared (ready-to-eat) meals.

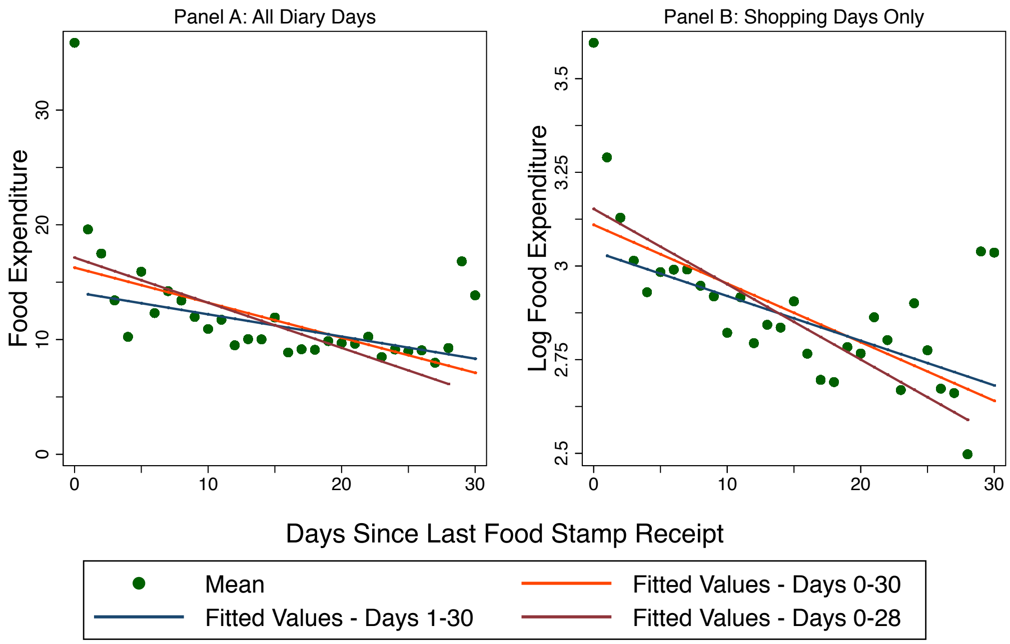

Figure 1: Food Expenditure Cycles in the CES

households shopping).[13] As shown in Figure 1, the decline from day zero to day one of the benefit month is very large. After that, expenditures decline steadily over the course of the month.

I do not use data after the fourth week of the benefit month (past $t = 28$). As shown in Figure 1, there is a spike there that may correspond to other income at the beginning of a new calendar or benefit month.[14] Also, I do not use diary observations that fall outside of the SNAP period corresponding to the reported disbursement because of uncertainty over whether the implied next disbursement will occur.[15] So long as $j = 1$ corresponds to $0 \leq t \leq 14$, all 14 diary days are potential shopping days. Overall, there are 17,665 household-days in the sample.[16] At least $1 of

[13] If households shop weekly, budgeting for four trips a month with a small gap to bridge at the end, a better comparison for day zero of the month is day 21. On this day, average expenditures are $9.63 ($31.34 conditional on shopping, with 31% of households shopping.

[14] While most states vary the day of disbursement across individuals, there is often bunching of the potential dates near the beginning of the month. Also, if the day of last SNAP disbursement is reported with some noise, this spike could be due to a new disbursement.

[15] This is because USDA data indicate that "churning" in and out of SNAP is very common: across six states in a study, 17-28% of households exited and re-entered within a four month period, with about a third of those households only leaving for one month (Mills et al. 2014).

[16] I remove households with incomplete information on size or children, missing SNAP benefit amount, SNAP benefit

SNAP-eligible purchases are made on 32% of these days. I call these days 'shopping' days. Panel B in Figure 1 shows the time path of log SNAP-eligible for expenditures on shopping days only. The large spike on day zero remains, but the estimated negative trend is again robust to excluding that point.

2.2 Methodology

2.2.1 Expenditure Trend Estimation

My baseline fixed-effect specification for estimating expenditure trends, without any heterogeneity or policy impact, is

$$e_{it} = \alpha_i + \gamma_1 t + Z_{it}\Theta_1 + \epsilon_{it} \quad , \tag{1}$$

where e_{it} are the total SNAP-eligible food expenditures of household i on days since SNAP receipt t, in 2017 dollars.[17] Z_{it} are other characteristics of the day in question to be controlled for: a weekend indicator variable, a week of calendar month variable and a week of diary variable.[18] e_{it} is constructed as the sum of all SNAP-eligible expenditures on a given diary day (all non-prepared food and beverage expenditures, besides alcohol).

I consider e_{it}, e_{it} on shopping days only (intensive margin), and the likelihood of $e_{it} \geq 1$ (extensive margin).[19] Examining the margin by which EBT impacts heterogeneity in expenditure

amount reported under $10, and unit size larger than twelve members from this baseline.

[17] A notable difference between this specification and that of Shapiro (2005) is the use of a fixed effect. This is enabled by the long household diaries in the CES offering 14 observations per household. The advantage is that fixed effects offer some robustness against specification error in this case. Because α_i represents household expenditures on day zero of the benefit month for all households in an OLS/Random Effects model, it is an out-of-sample projection for households observed late in the month. Specification error could produce systematically bad projections and thus a correlation between t and α_i, which necessitates the fixed-effects model.

[18] These variables are also indexed by i because the mapping from t to calendar day varies across households.

[19] Angrist & Pischke (2009) caution against using conditional-on-positive models to evaluate treatment effects because selection into positive values that is correlated with treatment will bias the estimates. I am able to examine that selection directly using the extensive margin estimates. In addition, using a conditional-on-positive model is less

Table 1: Food Expenditure Cycle Estimates

Dep. Var.:	e_{it}		e_{it} per capita		e_{it} per SNAP $		$ln(e_{it})$	$1(e_{it} \geq 1)$
Sample:	All	$e_{i,t} \geq 1$	All	$e_{i,t} \geq 1$	All	$e_{i,t} \geq 1$	$e_{i,t} \geq 1$	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
t	-2.73***	-2.72***	-0.97***	-0.80***	-0.02***	-0.02***	-0.06***	-0.03***
	(0.18)	(0.37)	(0.08)	(0.10)	(0.00)	(0.00)	(0.01)	(0.00)
Weekend	0.20	2.12	0.05	0.88*	-0.01	0.01	0.03	-0.02**
	(0.65)	(1.29)	(0.23)	(0.50)	(0.01)	(0.02)	(0.03)	(0.01)
Week of month	-0.91**	-1.35*	-0.30**	-0.35	0.00	-0.01	-0.03	-0.01
	(0.35)	(0.73)	(0.13)	(0.22)	(0.00)	(0.01)	(0.02)	(0.01)
Diary week	16.49***	13.98***	5.82***	4.12***	0.13***	0.10***	0.35***	0.20***
	(1.35)	(2.77)	(0.62)	(0.87)	(0.01)	(0.03)	(0.07)	(0.02)
Mean Dep. Var.	11.73	37.00	4.06	12.79	0.08	0.26	2.88	0.32
	[34.45]	[53.04]	[12.51]	[19.55]	[0.39]	[0.66]	[1.23]	[0.47]
Clusters	41	41	41	41	41	41	41	41
N	17,665	5,595	17,665	5,595	17,665	5,595	5,595	17,665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. All specifications feature household fixed effects.

patterns will help shed light on the mechanism behind the effects in Section 4.

Table 1 presents estimates of γ_1 from equation (1). Pooled across all households, average SNAP-eligible food expenditures decline roughly $2.73 per day over the benefit month. Limited to shopping days only, the estimate is very similar: $2.72 per day. Per-capita, I find a decline of $0.97 per day per person ($0.80 limited to shopping days only). As a fraction of SNAP benefits, I find a decline of 2.0% per day (1.8% limited to shopping days only). A $ln(e_{i,t})$ model on shopping days only indicates a decline of 6.2% per day.

problematic in a fixed-effects panel framework because the diary captures the same households at different times of the month. In the language of Angrist & Pischke (2009) on the analysis of experimental treatments using conditional-on-positive models, rather than calculating $E[y_{1,i}|y_{1,i} > 0] - E[y_{0,i}|y_{0,i} > 0]$, I calculate $E[y_{1,i} - y_{0,i}|y_{1,i} > 0, y_{0,i} > 0]$ (p. 99). In general, while OLS is an inconsistent estimator of the latent-determinant γ when the mass at $e_{it} = 0$ is the result of a latent process with censoring (Wooldridge 2002, p.524), it is a consistent estimator of the conditional expectation of e_{it}, when the zeros are genuine data (Angrist & Pischke 2009, p.96).

2.2.2 Policy Impact Estimation

In 1989 Maryland was the first state to begin implementing EBT statewide, with completion in April of 1993.[20] A number of states implemented the program voluntarily until 1996, when a federal welfare reform bill mandated the full implementation of EBT across the U.S. by October of 2002.[21] It took the median state just over one year to fully implement the program after the initial pilot. I use the month of statewide completion as the policy change date. The results are robust to the exclusion of the rollout period from the sample.

I add additional variables to the model as interactions with t. EBT_i is the main variable of interest, and control variables are X_i. X_i includes the number of adults (minus one) and the number of children (under 18). I also include SNAP benefit amount (minus $200, roughly the average benefit amount) and gross annual income (minus $20,000, roughly the average income) as control variables to try and account for any mechanical relationship between household composition and the expenditure trend.[22]

To consider a heterogeneous policy effect, I add a triple interaction between EBT_i, t, and all X_i variables. The main specification is

$$e_{it} = \alpha_i + \gamma_1 t + \gamma_2 (t \cdot EBT_i) + Z_{it}\Theta_1 + (t \cdot X_i)\Theta_2 + (t \cdot EBT_i \cdot X_i)\Theta_3 + \epsilon_{it} \quad . \tag{2}$$

In some specifications, I use year fixed effects, state fixed effects, state-specific linear time trends, and year fixed effects interacted with X_i, *all interacted with* t. In the absence of the fixed effects,

[20] Data from the USDA Food and Nutrition Service, `https://fns-prod.azureedge.net/sites/default/files/resource-files/ebt-status-report-state.pdf`.

[21] A number of states were unable to comply until 2003, and California and Guam did not complete implementation until 2004 (`http://www.fns.usda.gov/snap/short-history-snap`).

[22] All dollar variables are in 2017 $.

γ_1 is an estimate of the per-day change in food expenditures for a single individual with $200 in SNAP benefits, and a gross annual income of $20,000, prior to EBT. Θ_2 contains coefficients that represent the conditional correlations of the fixed household characteristics with the per-day change in food expenditures. γ_2 is the general effect of EBT on the expenditure trend and Θ_3 contains the heterogeneous EBT effect coefficients. The error term, ϵ_{it} is clustered at the state level, with 41 states in the sample.

While the specifications all include a household fixed effect, the identification of the policy impact relies on across-household differences in within-household time trends. Therefore, stability of the sample composition across the EBT implementation is important. A critical feature of this policy change for causal identification is that EBT rollout occurred at different times in different states over roughly a ten-year period (see Table 2 for the schedule). Thus, my estimates compare households within the same state over time and households at the same time across states (in the models without a state fixed-effects).

The broad welfare reform legislation that passed in 1996 is a specific event of concern. EBT was implemented at different times over a range of years, but the policy variable only ever turns on over time. Thus, there should be some correlation between the EBT indicator and the impacts of reform. If SNAP households after welfare reform are very different from pre-reform households, or if EBT itself induces differential SNAP selection, the sample will not be balanced across the policy change. Given the year fixed effects, state fixed effects and state-specific linear time trends, selection effects that sharply coincide with EBT are of primary concern. Table 3 shows the balance of household observables –SNAP benefit amount, household size, number of children, number of female adults, number of male adults, median adult age, the number of household members with non-zero earnings, gross annual income (in 2017 $), and the number of household members with

Table 2: Year of EBT Completion for States in Sample

Year	States	Month, Respectively
1993	Maryland	4
1995	Texas, South Carolina	11, 12
1996	Utah	4
	Welfare Reform Bill Passed - EBT Mandated	
1997	Kansas, Connecticut, Massachusetts, Alabama, Illinois, Louisiana	3, 10, 10, 11, 11, 12
1998	Oklahoma, Colorado, Idaho, Arkansas, Missouri, Oregon, Alaska, Hawaii, Pennsylvania, District of Columbia, Florida, Minnesota, Vermont, Georgia	1, 2, 2, 4, 5, 5, 6, 8, 9, 10, 10, 10, 10, 11
1999	New Hampshire, New Jersey, North Carolina, Arizona, Tennessee, Ohio, Kentucky, Washington	1, 6, 6, 8, 8, 10, 11, 11
2000	Wisconsin	10
2001	New York, Michigan	2, 7
2002	Indiana, Nevada, Virginia, Nebraska	3, 7, 7, 9
	EBT Implementation Deadline	
2003	Iowa	10
2004	California	6

Source: USDA Food and Nutrition Service, https://fns-prod.azureedge.net/sites/default/files/resource-files/ebt-status-report-state.pdf

high-school degrees, respectively in columns (1)-(8)– across the implementation of EBT, with and without year fixed effects, state fixed effects and state-specific linear time trends. Adding year fixed effects eliminates the significant difference in educational attainment I find across the policy change.

It is also important to determine whether states changed other aspects of SNAP or the safety net when EBT was implemented. Figure 2 shows SNAP caseloads (Panel A), Temporary Assistance for Needy Families (TANF) caseloads (Panel B) the SNAP disbursement calendar day (Panel C), and the within-state range of SNAP disbursement calendar day (Panel D) through the completion of EBT.[23] I plot a fit cubic and its 95% confidence interval as well. Caseloads look very smooth

[23]Caseloads are defined as the fraction of the state population participating in a program in any given month. SNAP data are from the USDA Food and Nutrition Service, http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap.TANF data are from the U.S. Department of Health and Human Services Office of Family Assistance (https://www.acf.hhs.gov/ofa/programs/tanf/data-reports).

Table 3: Household Characteristics and EBT Status

Dep. Var.:	SNAP ben. ('17 $) (1)	HH Size (2)	# kids (3)	# female adults (4)	Median adult age (5)	# earners (6)	Gross ann. inc. ('17 $) (7)	# HS Deg. (8)
				Panel A: Unconditional Means				
EBT	-8.53	-0.05	-0.10	0.01	0.31	0.08	32.84	0.29***
	(11.51)	(0.21)	(0.17)	(0.03)	(1.23)	(0.06)	(1,410.29)	(0.06)
				Panel B: Means with Year Fixed Effects				
EBT	16.80	-0.02	-0.12	0.04	-0.27	0.11	-148.45	0.01
	(27.70)	(0.47)	(0.34)	(0.07)	(1.88)	(0.13)	(2,020.38)	(0.05)
				Panel C: Means with Year and State Fixed Effects, and State-specific Linear Time Trends				
EBT	3.10	-0.15	-0.17	0.06	0.05	-0.07	1,105.51	0.02
	(25.25)	(0.27)	(0.24)	(0.07)	(2.07)	(0.11)	(2,665.56)	(0.13)
Mean Dep. Var.	268.86	3.34	1.62	1.14	40.74	0.62	20,244.39	0.87
	[191.03]	[2.01]	[1.67]	[0.61]	[15.47]	[0.81]	[21,096.21]	[0.91]
Clusters	41	41	41	41	41	41	41	41
N	1,578	1,578	1,578	1,578	1,575	1,578	1,578	1,578

$^{***} \Rightarrow p < 0.01$, $^{**} \Rightarrow p < 0.05$, $^{*} \Rightarrow p < 0.10$. Estimates are from OLS regressions of the dependent variable on EBT completion status. Standard errors in parentheses are clustered at the state level. All specifications in Panel B feature year fixed effects, with 1994 as the excluded year. All specifications in Panel C feature year fixed effects, with 1994 as the excluded year, state fixed effects with California as the excluded state, and state-specific linear time trends.

through the policy change. Average SNAP disbursement day exhibits a slight decrease, although this is largely driven by the large outlying observation in the month prior to EBT completion. I need at least two observations per-state per-period to define the disbursement range, and therefore I have to aggregate the data up to the quarterly level in Panel D. While the cubic jumps slightly at EBT completion, this appears to be due to over-fitting. The corresponding regression-discontinuity estimates show that none of the variables change significantly when EBT is implemented.[24]

Panels C and D are particularly important, as Carr & Packham (2018) find effects of recent changes to disbursement dates on theft. Administrative data on EBT disbursement dates from 1998 onward shows only two states in my sample changed the range of disbursement dates

[24]Cubic specifications produce p-values of 0.48, 0.87, 0.13, and 0.13 (with a negative coefficient) for Panels A-D respectively. Due to what looks like cubic over-fitting in Figure 2, I also estimate linear specifications, which produce p-values of 0.81, 0.61, 0.81, and 0.32 for Panels A-D respectively. Specifications feature triangular kernels, optimal bandwidth selection, and standard errors clustered at the state level (Calonico et al., 2017).

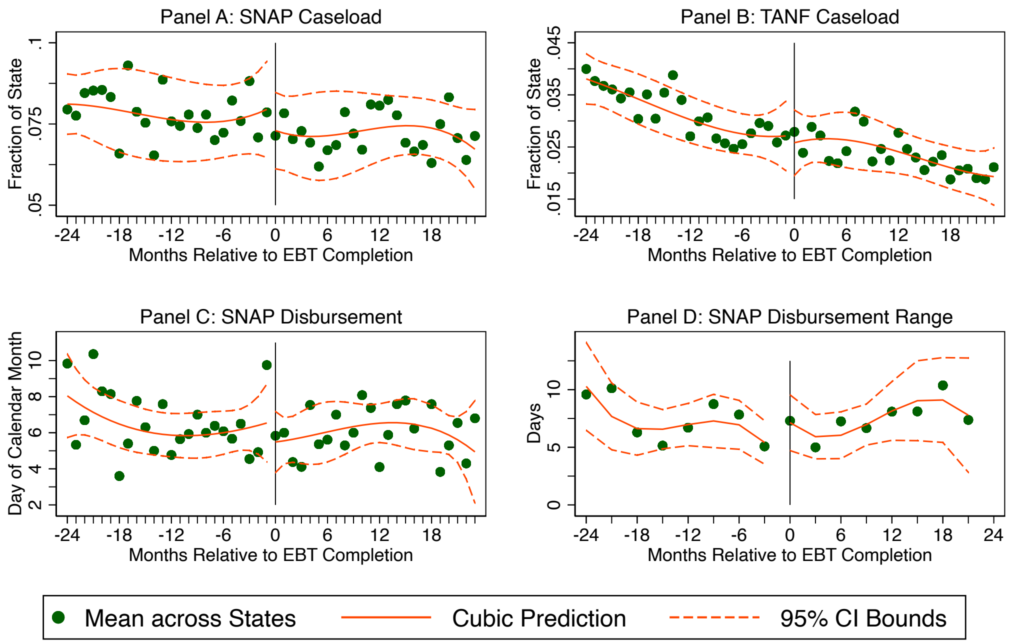

Figure 2: Welfare Program Characteristics through EBT Implementation

during the sample: Maryland in 2003, and Pennsylvania somewhat continuously from 1999 to 2003.[25]Maryland switched to EBT ten years prior in 1993, and Pennsylvania completed its rollout in 1998. Excluding Pennsylvania does not affect the results.

The strong downward trend in TANF caseloads in Panel B indicates that while there isn't a discontinuity at EBT implementation, there is an average before-after EBT difference that will require time trends to fix. Table A1 features specifications similar to Table 3 using the policy variables from Figure 2 instead. Indeed, SNAP caseloads and TANF caseloads are significantly lower after EBT is implemented, but by adding the full set of fixed effects and time trends, EBT has a precise zero impact on caseloads.

I also evaluate whether the SNAP participation rate is affected by EBT. [26] Estimates are shown

[25]Data from the USDA's Economic Research Service: `https://www.ers.usda.gov/data-products/snap-policy-data-sets/`

[26]Data are pieced together from (Schirm & Castner, 2002), (Castner & Schirm, 2004) and (Castner & Schirm, 2006).

in column (5) of Table A1. Consistent with an unconditional correlation between welfare reform and EBT, the unconditional difference in means shows a negative and significant correlation, but this is eliminated with year fixed effects.

3 Results

3.1 Main Estimates

Table 4 shows results from estimating equation (2) with a variety of specifications of control variables, fixed effects and time trends. The sample is limited to shopping days only. For space, only coefficients of direct interest are presented, with the full set of estimates in Appendix Table A2. While the number of adults is not a strong predictor of how the expenditure trend reacts to EBT, the number of children in the household is. Prior to EBT, an additional child is correlated with a 38% larger decline in expenditures on shopping days over the benefit month (from column (4)). The implementation of EBT fully counteracts this correlation. For example, consider households with one adult and two children, which feature average pre-EBT shopping trips of roughly \$32. EBT flattens the slope of the expenditure trend from \$3.61 per day to \$2.26 per day (estimates from column (4), all else held equal).[27] Appendix Tables A3 and A4 present results for the extensive margin impact of EBT on food shopping and the total effect on expenditures. There is no evidence that EBT affected the extensive margin, or that the number of children ever matters for the extensive margin. Thus, the total effect represents an average of the intensive-margin effect

[27] For the average household (3.32 members, 1.62 children), the impact of EBT is to flatten the slope of expenditure trend by \$0.72 per day ($p = 0.04$, 21% of the pre-EBT slope, estimates from column (4) of Table 4). When calculating this estimate, it is important to recall that one is subtracted from the household size variable in the regressions.

Table 4: Impact of EBT on Food Expenditure Cycles, Shopping Days Only

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)	(6)
t	-2.88***	-1.59***	-1.42**	-2.05**	-2.05**	-2.64***
	(0.39)	(0.42)	(0.55)	(0.77)	(0.80)	(0.81)
t X EBT	0.41	-0.70*	-0.61	-0.45	-1.12	-1.06
	(0.28)	(0.37)	(0.57)	(0.71)	(0.68)	(0.76)
t X # kids		-0.70***	-0.78***	-0.78***	-0.77***	-0.74***
		(0.17)	(0.19)	(0.19)	(0.21)	(0.22)
t X # kids X EBT		0.62***	0.85***	0.90***	0.90***	1.10***
		(0.19)	(0.26)	(0.27)	(0.30)	(0.34)
t X # adults - 1			-0.19	-0.13	-0.24	-0.29
			(0.42)	(0.41)	(0.40)	(0.42)
t X # adults - 1 X EBT			-0.28	-0.41	-0.44	-0.37
			(0.47)	(0.46)	(0.48)	(0.49)
Impact of EBT (single parent, 2 kids)	0.41	0.54**	1.08***	1.35***	0.68	1.14
	(0.28)	(0.26)	(0.37)	(0.43)	(0.64)	(0.89)
Impact of EBT (dual parent, 2 kids)	0.41	0.54**	0.80*	0.93**	0.24	0.76
	(0.28)	(0.26)	(0.42)	(0.43)	(0.64)	(0.86)
Date Controls	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	N	Y	Y	Y	Y
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income interacted with t, and their triple interactions with EBT are included as controls in columns (3)-(6). Full results available in Appendix Table A2.

and the null extensive-margin effect. The result is a statistically significant correlation between the number of kids and the size of the pre-EBT expenditure decline, and a statistically insignificant partial mitigation of that correlation (34-48% of the pre-EBT coefficient) affected by EBT.[28]

Estimates obtained using a quadratic expenditure trend are in Appendix Table A5. The square-

[28] Following Smith et al. (2016) I check to see whether the models in Table 4 are affected by endogenous selection into shopping days using a two-step Heckman approach (Heckman, 1979) with month indicator variables as the excluded instruments. The inverse-Mills term is never significant ($p = 0.68, 0.67, 0.74, 0.74, 0.93, 0.86$ across the six columns, respectively), and the heterogeneous effect of EBT by the number of children remains significant at the 1% level in columns (2)-(5). I thank an anonymous referee for this suggestion.

term is positive, suggesting a larger slope at the beginning of the month –consistent with the data in Figure 1. However, none of the square-term interactions are ever statistically significant, and thus the heterogeneous effects of EBT all load on to the linear term. Specifications with alternative dependent variables are presented in the Appendix: household per-capita expenditures in Appendix Table A6, per-SNAP $ expenditures in Appendix Table A7 and log expenditures in Appendix Table A8. The positive, precise coefficient on the interaction of EBT and the number of children is robust across all models, while the corresponding negative pre-EBT coefficient is less so. I return to this issue using consumption data in Section 3.3. Table A9 shows that the heterogeneous effect of EBT does not depend on when, in the calendar month, benefits arrive.

To offer additional clarity on the differential effect of EBT, I estimate a homogeneous impact of EBT within relevant household types. Table 5 shows estimates of *per-capita* expenditure cycles (to aid the comparison across household types) for all households, household without kids and households with successively more kids. Households without kids experience a negative and statistically insignificant impact of EBT ($p = 0.67$), and the effect for households with any number of kids, pooled, is effectively zero ($p = 0.66$). More children in the household matter: the effect grows (and becomes statistically significant) along with the number of children in the household. With more than one child, 27% of the per-capita decline is mitigated by EBT ($p = 0.09$), with more than two 48% is mitigated ($p < 0.01$), and with more than three the decline is more-than-fully mitigated ($p < 0.01$).

Figure 3 presents a non-parametric comparison of the impact of EBT on single adults versus single parents with two children. In Panel A the moderate expenditure decline for single adults is the same before and with EBT. The level effects of EBT are not statistically significant. In Panel B, the very pronounced expenditure decline for single parents with two children before EBT

Table 5: Impact of EBT on Per-capita Food
Expenditure Cycles by # of Kids, Shopping Days Only

Household type:	All (1)	$k = 0$ (2)	$k > 0$ (3)	$k > 1$ (4)	$k > 2$ (5)	$k > 3$ (6)
t	-1.10***	-1.66*	-0.89***	-0.81***	-0.90***	-0.80*
	(0.24)	(0.86)	(0.21)	(0.19)	(0.23)	(0.40)
t X EBT	0.05	-0.14	0.06	0.22*	0.43***	0.94***
	(0.11)	(0.36)	(0.14)	(0.13)	(0.14)	(0.24)
Mean Dep. Var.	12.79	20.74	9.67	9.09	8.52	7.57
[SD]	[19.55]	[27.34]	[14.30]	[13.44]	[12.08]	[10.22]
Date Controls	Y	Y	Y	Y	Y	Y
Adults, SNAP, Income Controls	Y	Y	Y	Y	Y	Y
Year FE X t	Y	Y	Y	Y	Y	Y
Clusters	41	40	41	41	38	30
N	5,595	1,578	4,017	2,952	1,684	825

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year. A weekend indicator, week of month trend, diary week indicator, and SNAP benefit amount and household income interacted with t are included as controls. Full results available in Appendix Table A10.

is replaced with steady spending for the first two weeks of the benefit month and then a smaller decline. For this type of household, the level effect of EBT is positive and marginally statistically significant ($p = 0.06$) over weeks 2-4 of the benefit month. It is negative and not significant at conventional levels ($p = 0.13$) in the first week.[29]

Appendix Table A11 disaggregates the number of children into the number by age group: pre-school age (0-5) primary/middle school age (6-12) and teenagers (13-17). Qualitatively, there are similar patterns for each group. However, the effects appear most strongly for primary/middle school age children. Appendix Table A12 shows that the heterogeneous impact of EBT is slightly larger in magnitude when the data from during EBT rollout are excluded.

[29]Estimates are obtained from random effects regressions (because EBT, as opposed to t X EBT, does not vary within households) of food expenditure, conditional on shopping, on EBT, limited to the relevant benefit week and household type. There are no control variables in this specification; it is meant as a direct test of the data in the figure as a contrast with the more structured approach I take elsewhere.

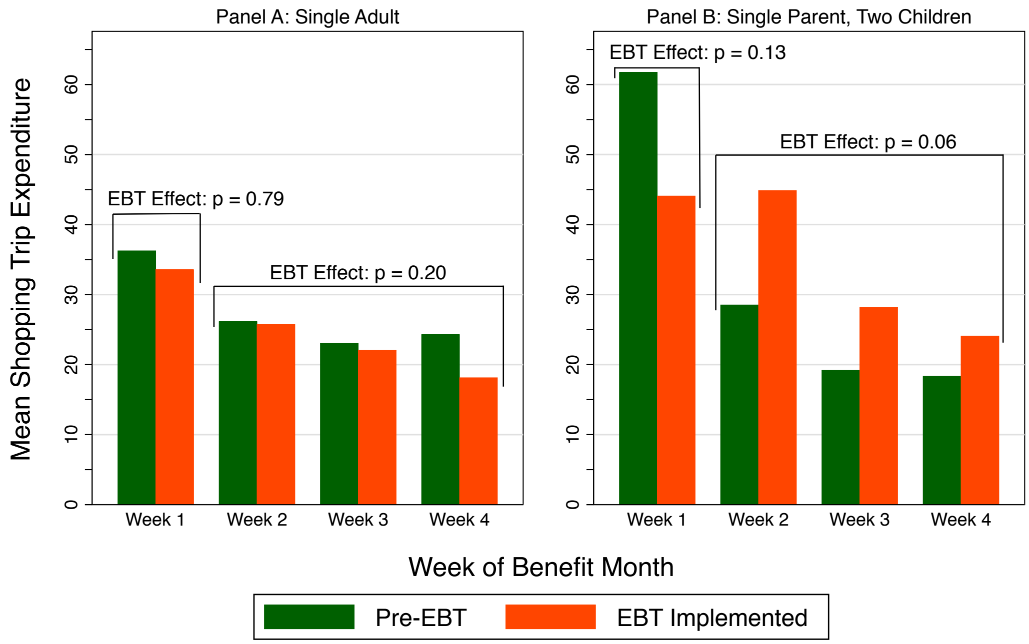

Figure 3: Impact of EBT on Food Expenditure by Week of Benefit Month, Shopping Days Only

3.2 Robustness

An important concern with the analysis of any state-by-state program implementation is whether states selected in to treatment based on conditions related to the variables of interest. I argue that this study is not at high risk for this problem. First and foremost, the implementation of EBT was mandated by the federal government as a part of the 1996 welfare reform legislation. As shown in Table 2, the majority of states in the sample implemented EBT after that mandate was passed. Bednar (2011) shows that implementation dates for both voluntary and mandatory adopters cannot be predicted using 1990 state characteristics. Second, I observe nearly every state both before and after the implementation of EBT. I re-estimate the main specifications in Table 4 with all voluntary adoption states excluded, and states I only observe with or without EBT excluded. This removes the voluntary adopters of Maryland, Texas, South Carolina and Utah, and the late adopters of Iowa and California.[30] Results are presented in Appendix Table A13 and are similar to those in Table 4: the main result is not driven by states that voluntarily adopted EBT.

The most substantial threat to identification is the changing nature of households enrolled in SNAP over time. While Table 3 shows balance on household observables, of course unobservables remain a concern. A variety of law changes –in 1993, 1996, 2001, and 2002– push the participation criteria back and forth along a variety of dimensions. For more detail see Appendix Section A.1. With so many changes occurring throughout the sample period, and a range of EBT implementation dates, it is hard to simply characterize which compositional shifts are most strongly correlated with EBT.[31] This is exactly why the generalized difference-in-difference design is appropriate here: the policy changes at different times in different states, allowing for identification averaged across a variety of different policy periods. However, the Personal Responsibility and Work Opportunities Reconciliation Act of 1996 (or commonly, "welfare reform") that mandated EBT is by far the most notable policy change during the sample, and indeed there is work on the impact of welfare reform on SNAP caseloads.[32] I estimate the specifications from Table 4 with a control variable for the completion of welfare reform, interacted both with t and the interaction with t and EBT. I also exclude data during the phase-in of welfare reform, from October 1996 to February 1998 (Looney, 2005). Results are in Table A14. Both the pre-EBT correlation between the number of children and the expenditure trend, and the heterogeneous impact of EBT remain robust.[33]

[30] Arkansas and Idaho also removed from this sample, but due to small samples that all happen to fall before EBT (in the case of Arkansas) or after implementation (in the case of Idaho).

[31] This is further complicated by the fact that states implemented other aspects of welfare reform at different points in time, not coincident with EBT.

[32] Both Wallace & Blank (1999) and Ziliak et al. (2000) find that falling enrollment in the period after welfare reform was most substantially driven by strong economic growth rather than legislative changes. Ziliak et al. (2000) conclude that "the major policy changes affecting the Food Stamp Program (that is, introduction of EBT and ABAWD waivers) did not appear to have major effects on the food stamp caseload." (p. 636).

[33] The models that do not feature state fixed effects show a patten of EBT having a large homogeneous effect, and then welfare reform wiping it out. The fact that this goes away with state fixed effects suggests that it is due to an outlying state in the limited observation window post-EBT, pre-welfare reform.

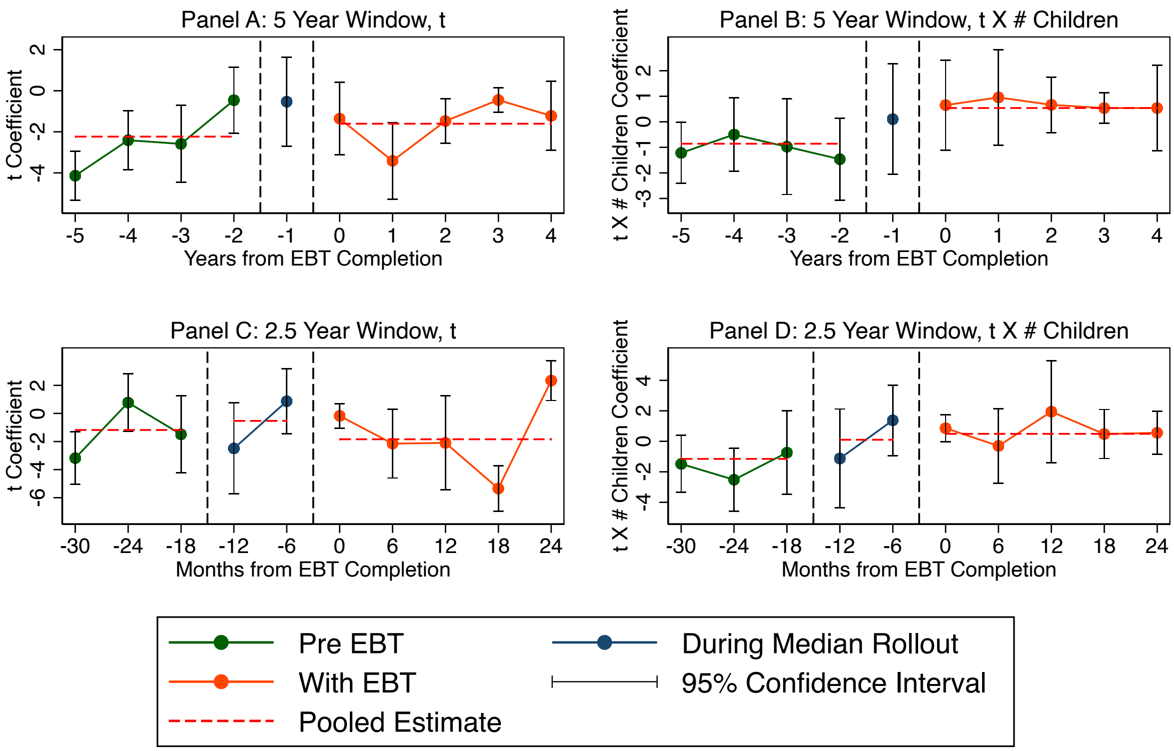

Figure 4: Event Study Analysis of the Impact of EBT

While the estimates of the heterogeneous impact of EBT in the previous section survive year and state fixed effects, and state specific linear time trends, state-specific non-linearities in the unobservable characteristics of participating households could remain. I take an event-study approach in Figure 4 that puts no restrictions on the shape of time trends. Panels A and B show a five-year window before and after EBT completion, with data pooled within years. Panels C and D zoom in to show a 2.5-year window, with data pooled within six-month periods. In each time period I regress food shopping expenditures on days since benefit disbursement and its interaction with the number of children in the household.[34] Panels A and C present the t coefficients from these regressions, and Panels B and D present the t X # children coefficients.

[34]These regressions contain household fixed effects, and control variables for the interaction between household size and the expenditure trend, a weekend indicator, a week of month trend and a diary week variable. Standard errors are clustered at the state level.

In Panels B and D, the change in the correlation between the number of children and the expenditure trend begins during EBT implementation and then holds steady in the post period. Isolating the closest pre- and post-periods in Panel B, during the second year prior to the completion of EBT, an additional child is correlated with a \$0.73 larger daily decline in expenditures, and during first year with EBT an additional child is correlated with a \$0.86 smaller daily decline in expenditures. This difference of \$1.31 is statistically significant ($p = 0.04$), and slightly larger than the largest heterogeneous EBT effect estimate of \$1.10 in Table 4. Further limiting the sample and examining the change from from 18-12 months prior to EBT to the first six months with EBT completed in Panel D shows a bigger change (the coefficient shifts from -\$1.46 to \$0.65) although the smaller sample leads to a lack of precision ($p = 0.14$). The t coefficient is noisy, especially in the six-month period data in Panel C. However, there are no clear or significant changes that coincide with EBT rollout or completion. Neither the change from the second year prior to EBT to the first year with EBT in Panel A, nor the change from from 18-12 months prior to EBT to the first six months with EBT in Panel C, is statistically significant ($p = 0.32$, and $p = 0.27$, respectively).

While the estimates in Figure 4 come from a sparse specification, I take a second event-study style approach based on the main specifications presented in Table 4. I include interaction terms between t, year fixed effects, and the number of children in the household. This yields exclusively within-year estimates of the heterogeneous impact of EBT, which offer additional robustness to heterogeneous impacts of welfare reform. The estimates of both the pre-EBT heterogeneity and the heterogeneous impact of EBT by the number of children are slightly larger (as are the imprecise negative level impacts of EBT) when these terms are included. Results are presented in Appendix Table A15.

One relevant policy change occurred over the same time time horizon, staggered state-by-state: the expansion of SNAP-Ed. SNAP-Ed, the nutrition education component of SNAP, was first funded in 1992 on a voluntary basis.[35] Some of the trainings and information they provide involves budgeting, with an emphasis on setting specific weekly goals for food.[36] By 2004, all states had some form of SNAP-Ed program. I estimate the specification from column (4) of Table 4 with controls for the existence or size of state-level SNAP-Ed programs and their interactions with the number of children in a household.[37] Results are presented in Appendix Table A16. There is no evidence that the implementation of SNAP-Ed programs, rather than the implementation of EBT, explains the heterogeneous change in expenditure trends I identify.

A final robustness test is to use SNAP-ineligible spending as a placebo test for the effect of EBT. Because SNAP benefits are infra-marginal to total food spending, it should be that they also display an expenditure cycle over the SNAP month. However, they should not respond at all to EBT. Using the same set of models as in Table 4, I find that the coefficient on the t variables is always negative and statistically significant. There are no statistically significant homogeneous or heterogeneous effects of EBT on the cycle in SNAP-ineligible spending. Results are in Table A17.

3.3 Consumption

Even if EBT changed expenditure patterns for some households, that does not necessarily imply that consumption patterns changed as well. For example, Aguiar & Hurst (2005) find that households smooth consumption, but not expenditure, through the anticipated income change at retirement. On the other hand, Kuhn (2018) finds that SNAP households' consumption and expen-

[35]See the USDA's National Institute for Food and Agriculture for an overview https://nifa.usda.gov/program/supplemental-nutrition-education-program-education-snap-ed.

[36]Access the full library of materials here: https://snaped.fns.usda.gov/library.

[37]Data are available from the USDA SNAP-Ed Connection program (https://snaped.fns.usda.gov/sites/default/files/documents/SNAP-EdBudgetAllocationFY1992-2017.pdf).

diture trends are correlated. There are a number of reasons why I argue that EBT may have had a heterogeneous impact on consumption in addition to expenditures. First, when I limit my sample to include expenditures on perishable foods only, I find similar results (see Appendix Table A18).[38] Second, previous literature has identified both consumption and expenditure cycles amongst SNAP participants. Third, using the 1989-1991 Continuing Survey of Food Intake by Individuals (CSFII), I find that prior to EBT, the heterogeneity in the log-household-calorie consumption trend matches the heterogeneity in the expenditure trend identified in Section 3.1.[39]

I modify equations (1) and (2) slightly to estimate the consumption trend. I replace e_{it} with c_{it}, a household's total caloric consumption on day since SNAP disbursement t. Because the CSFII only offers 3 days of observation for a household (as opposed to 14 in the CES), purely within-household estimates of the time trend access a very limited fraction of the variance in t. I therefore adopt a random-effects specification, and add day-of-month fixed effects, following Shapiro (2005). Household size, SNAP benefit amount, household income, and their interactions with t remain as control variables. I add household Special Supplemental Nutrition Program for Women, Infants and Children (WIC) participation and the number of children getting free or reduced-price school meals as control variables.

The sample construction is similar to that in the CES, with a couple exceptions. While the data contain a report of the overall household size, not all members contribute diaries, and there is limited information on the characteristics of those who do not. Therefore, I restrict my attention to households with a consistent number of diaries each day and the same age profile across survey days. Additionally, there are some households with a consistent number of diaries each day, but

[38]I classify fresh fruits and vegetables, non-frozen dairy items and non-frozen meat/seafood as perishables.

[39]The 1994-1996, 1998 wave of the CSFII did not record the date of SNAP arrival, and the survey was then discontinued. This means I cannot estimate the impact of EBT with these data.

Table 6: Pre-EBT Consumption Trend Heterogeneity

Dep. Var.:	kCal			ln(kCal)		
	(1)	(2)	(3)	(4)	(5)	(6)
t	-31.276**	-7.538	-6.511	-0.007**	-0.001	0.000
	(12.463)	(8.107)	(10.485)	(0.004)	(0.003)	(0.004)
# kids		1657.698***	1364.840***		0.476***	0.401***
		(115.608)	(158.995)		(0.028)	(0.037)
t X # kids		-7.555	-10.731		-0.004**	-0.005**
		(6.545)	(9.705)		(0.002)	(0.002)
# adults - 1		1697.379***	1602.360***			0.444***
		(227.935)	(219.629)			(0.052)
t X # adults - 1		4.510	0.703			-0.002
		(16.206)	(14.522)			(0.003)
Mean Dep. Var.	4,110.957	4,110.957	4,110.957	8.032	8.032	8.032
[SD]	[3,067.321]	[3,067.321]	[3,067.321]	[0.805]	[0.805]	[0.805]
Day-of-month FE	Y	Y	Y	Y	Y	Y
SNAP, Inc., WIC, FRP Controls	N	N	Y	N	N	Y
Clusters	757	757	757	757	757	757
N	1,864	1,864	1,864	1,864	1,864	1,864

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the household level. All specifications feature household random effects, a weekend indicator, and day-of-month fixed effects with the first of the month excluded. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least \$10. Columns (3) and (6) feature controls for SNAP benefit amount, household income, WIC participation, and free/reduced price school breakfast and lunch participation and all of their interactions with t. WIC participation is a household-level indicator variable, and the FRP (free or reduced-price) breakfasts and lunches variables counts the number of household members receiving those benefits. Full results available in Appendix Table A19.

contain days with a reported zero for caloric intake. I exclude these observations. I follow the convention of only including observations that occur in the four weeks following a reported SNAP disbursement and avoid inferring the date of other disbursements. This leaves me with 757 households and 1864 household-days. Results for the coefficients of interest are presented in Table 6 for both the level and log of household caloric consumption.

Columns (1) and (4) show a significant consumption decline for all households pooled: a decline of roughly 31 kCal, or 0.7%, per-day. By the end of the fourth week of the benefit month, the linear estimate extrapolates to a deficit of more than 800 kCal lower than on day zero, which is between one-quarter and one-half of the USDA-recommended daily caloric intake for an adult.[40] Allowing the consumption decline to vary with the number of children and adults in columns (2) and (4) demonstrates that the daily consumption decline for a single adult household is not statistically significant ($p = 0.35$, and $p = 0.68$, respectively). However, in column (2), the coefficient on the number of children is not statistically significant ($p = 0.25$). In column (4), the coefficient on the number of children is statistically significant ($p = 0.03$), and suggests that for each child added to the household, the consumption decline increases by 0.04% per day. Adding a larger set of control variables in columns (3) and (6) has little effect.

4 Potential Explanations

4.1 Stigma and Security

Reduced visual stigma associated with using benefits (Currie & Grogger, 2001) and reduced risk of benefit theft are natural candidates for explaining the effect of EBT as they relate directly to goals of the EBT program. These mechanisms predict changes to the extensive margin of shopping behavior over the benefit month in the following ways. If there is stigma associated with using visually identifiable food coupons, SNAP users with coupons should try to minimize the number of SNAP-financed shopping trips they take each month.[41] EBT allows them to spread expenditures out more evenly over more trips over the course of the month. Concerns about safely storing food coupons produces a similar incentive –spend them in quickly after they arrive– that EBT mitigates. And perhaps households with more children experience more stigma or more concern about benefit

[40] Referenced from the USDA's 2015-2020 Ditary Guidelines https://www.dietaryguidelines.gov/sites/default/files/2019-05/2015-2020_Dietary_Guidelines.pdf.

[41] The alternative to visual stigma is flat or per-se stigma (Moffitt, 1983), which is relevant for program participation rather than benefit usage conditional on participation. The benefit-usage stigma mechanism proposed here is a joint hypothesis that stigma is experienced in the store, and that EBT lessens it. In many cases EBT cards are easy to identify.

Table 7: Impact of EBT on Food Expenditure Cycles, Likelihood of Shopping

Mean Dep. Var.: 0.317 [0.465]	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.033***	-0.033***	-0.035***	-0.032***	-0.032***	-0.034***
	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
t X EBT	0.001	0.000	0.002	0.005	0.005	0.007
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)
t X # kids		-0.000	0.001	0.001	0.001	0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
t X # kids X EBT		0.000	-0.001	-0.001	-0.001	-0.001
		(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
t X # adults - 1			0.001	0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)	(0.001)
t X # adults - 1 X EBT			-0.001	-0.001	-0.001	-0.000
			(0.002)	(0.002)	(0.002)	(0.003)
Date Controls	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	N	Y	Y	Y	Y
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	17,665	17,665	17,665	17,665	17,665	17,665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income interacted with t, and their triple interactions with EBT as well are included as controls in columns (3)-(6). Full results available in Appendix Table A3.

theft.

The impact of EBT on the daily likelihood of SNAP-eligible spending is presented in Table 7. I estimate models identical to those in Table 4 with an indicator variable for $e_{it} \geq 1$ as the dependent variable. The likelihood of shopping does decline over the course of the month. However, EBT has no homogeneous impact on shopping behavior over the month, nor do I find any heterogeneous impact of EBT according to the number of children in the household.

There are other reasons to be skeptical of these two explanations. Theoretically, heterogeneity in stigma and theft concerns could vary in either direction with the number of children in a household. Researchers have taken SNAP participation as one measure of stigma, but the literature on the impact of EBT on participation shows no clear effects (see Section 2.3). Currie & Grogger (2001) estimate a heterogeneous impact of EBT on participation and find enrollment gains only for rural households and married couples with no children. Also, reports of theft are very rare. A 1995 report from the Government Accounting Office stated that "losses to the [Food Stamp] Program due to counterfeiting of food stamp coupons and mail theft are not significant." 0.4% of the value of mailed benefits in 1993 was reported lost or stolen from the mail. In that year, only 79 criminal investigations were opened into the matter (Robinson et al., 1995).

4.2 Benefit Ownership

A robust literature in public economics documents that the delineation of within-household property rights over income –government transfers in particular– can affect how it is spent (Browning et al., 1994; Lundberg et al., 1997; Browning & Chiappori, 1999; Duflo, 2003; Bobonis, 2009; Attanasio & Lechene, 2014; Attanasio et al., 2012; Wang, 2014). The household is not a perfectly efficient bargaining unit, and therefore differences in preferences over goods matter. It may be the case the differences in time preferences can matter in a similar way; reallocations of property rights could thus affect the dynamics of spending. Furthermore, Shapiro (2005) posits that consumption declines over the benefit month may be a result of dynamically-inconsistent time preferences. Theoretical work on group discounting by Hertzberg (2018) and Jackson & Yariv (2015) indicates that preference aggregation across independent consumption streams or differing discount factors can cause behavior that appears indicative of dynamic inconsistency, even when no group members are inconsistent themselves.[42] While preference differences and independent consumption within households, and thus the potential for dynamic inconsistency are not specific to low-income or SNAP households, they should only manifest in spending patterns and have potential welfare consequences for budget-constrained households. In other words, when any household is forced into difficult circumstances, dynamic inconsistency that has always existed may begin to bite.

Could EBT have unified control over SNAP benefits within households? If so, it should have had two effects: 1) behavior would become more representative of the primary recipient's preferences, and 2) dynamic inconsistency through preference aggregation should diminish. The directional effect of 1) depends on whether the primary recipient is more patient than others in the household, whereas the effect of 2) –while second order– is to unambiguously lead to more patient decision-making.

How could these manifest in practice? Consider a single parent with two children. At the end of a benefit month, resources are scarce and everyone in the household is skipping breakfast. When benefits arrive, they go grocery shopping, and the hungry kids make requests for purchases that mom or dad has a hard time refusing. Prior to EBT, the kids are aware that the household has new resources available. With EBT, they are not; the parent can express their more patient preferences more clearly, for example, by saying "we can't afford that right now." Furthermore, the degree of time inconsistency is reduced, meaning that mom's forecasts of the household's future behavior

[42]In general, whenever members of the group have at least partially independent consumption streams or different discount rates, non-dictatorial preference aggregation leads to Collective Present Bias (CPB). This means that one need not believe in individual present-bias to expect groups with limited resources to exhibit behavior that appears present-biased. Others, including Bernheim (1999), Gollier & Zeckhauser (2005), Jamison & Jamison (2011) and Zuber (2011) allude to similar effects of preference aggregation. Jackson & Yariv (2014) find laboratory evidence of this, and Schaner (2015, 2016) finds evidence using lab-in-the-field experiments with savings accounts in Kenya. Shapiro (2005) argues that the month-long benefit cycle is too short for any significant decay of consumption over time to be explained by high exponential discount rates. With that view, the entire consumption decline is attributable to credit constraint and dynamic inconsistency. One implication of CPB is that changing the property rights and thus the bargaining process within a household can changes the household's degree of dynamic inconsistency.

are more accurate, which encourages more frugal decision-making in the present.[43]

Neither of these effects should manifest in single-individual households, which is consistent with the estimates in Table 4. The heterogeneous effect should be strongest for kids that are old enough observe and understand what food coupons imply about parents' ability to buy food, and to verbalize their demands, but young enough to demand immediate gratification.[44] This is qualitatively consistent with the estimates in Appendix Table A11, although the differences in heterogeneous effect sizes across age groups is not statistically significant. Perhaps the clearest prediction of this model is that EBT should matter more for multiple-adult households than single-adult households, which is inconsistent with the estimates in Table 4. The lack of an extensive-margin effect is also inconsistent with a version of this model where food coupons were divided up and spent separately –requiring more total trips– prior to EBT. One explanation for the lack of an effect for multiple-adult households is that the two effects of EBT can counteract one another in this case: if the primary recipient of SNAP benefits is less patient than other adults, EBT can reduce dynamic inconsistency, but it will make preferences more representative of the less patient adult.

An additional test of the benefit ownership mechanism is that if EBT really matters for SNAP property rights within the household, it should also impact the types of items purchased. For example, EBT should decrease (increase) purchases of indulgent (repugnant) food for children. In Table 8 I report regressions of vegetable and sweets purchases on the number of children in a household, EBT status, and their interaction, while controlling for total food spending. Sweet expenditures consist of cookies, ice cream and candy, and vegetable expenditures consist of fresh, frozen, dried

[43]See Appendix A.2 for a structural estimation of the β from a β-δ model of Collective Present Bias, using EBT for identification.

[44]See Andreoni et al. (2019) for evidence and a discussion of the literature on the evolution of time preferences with child age.

Table 8: Impact of EBT on Goods Purchased

	Sweets Expenditures ('17 $)				Vegetable Expenditures ('17 $)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All expenditures ('17 $)	0.042***	0.042***	0.042***	0.042***	0.057***	0.057***	0.057***	0.057***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
EBT	0.086	0.005	-0.024	-0.021	-0.014	-0.022	-0.053	-0.106
	(0.053)	(0.059)	(0.066)	(0.075)	(0.048)	(0.064)	(0.086)	(0.074)
# adults - 1	-0.054	-0.051	-0.046	-0.043	0.068**	0.067**	0.058*	0.063*
	(0.033)	(0.034)	(0.036)	(0.038)	(0.031)	(0.031)	(0.030)	(0.031)
# adults - 1 X *EBT*	0.051	0.045	0.040	0.044	-0.030	-0.026	-0.021	-0.027
	(0.050)	(0.050)	(0.051)	(0.052)	(0.040)	(0.041)	(0.042)	(0.043)
# kids	0.051**	0.046**	0.043*	0.045*	-0.015	-0.014	-0.012	-0.012
	(0.020)	(0.021)	(0.022)	(0.023)	(0.027)	(0.029)	(0.027)	(0.028)
# kids X *EBT*	-0.063**	-0.060**	-0.057**	-0.064**	0.030	0.028	0.032	0.036
	(0.025)	(0.024)	(0.024)	(0.025)	(0.030)	(0.032)	(0.030)	(0.031)
Mean Dep. Var.	0.58	0.58	0.58	0.58	0.70	0.70	0.70	0.70
[SD]	[2.59]	[2.59]	[2.59]	[2.59]	[2.68]	[2.68]	[2.68]	[2.68]
Date Controls	Y	Y	Y	Y	Y	Y	Y	Y
SNAP, Inc. Cont.	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	N	Y	Y	Y	N	Y	Y	Y
State FE	N	N	Y	Y	N	N	Y	Y
State-Year Trend	N	N	N	Y	N	N	N	Y
Clusters	41	41	41	41	41	41	41	41
N	17665	17665	17665	17665	17665	17665	17665	17665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses beneath the estimates are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. 1994 is the excluded year. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income, and their interactions with EBT are included as controls in all columns. Sweets consist of cookies, ice cream, and candy. Vegetables consists of fresh, frozen, canned, and and dried vegetables and legumes, as well as fresh, canned and frozen vegetable juices. Full results available in Appendix Table A20.

and canned vegetables, tomatoes and beans. The regressions specifications are designed similarly to those of the main specification presented in Table 4, but in levels rather than trends.[45]

I find no evidence of a homogeneous effect of EBT on either type of spending. Prior to EBT, I find that the number of children in a household is a statistically significant (marginally so in columns (3) and (4)), positive predictor of spending on sweets, holding fixed the number of adults, and total eligible food spending. The finding is less precise in the larger models. EBT significantly

[45]This means that I cannot include household fixed effects in these specifications.

counteracts this effect in all models. After EBT, the estimates imply no significant correlation between the number of kids and sweets spending. The opposite does not appear to be true for vegetable spending. While households with more adults tend to spend more on vegetables all else equal, there are no significant correlations between the number of kids and vegetable spending prior to EBT, nor any significant heterogeneous effects of EBT.

4.3 Imperfect Salience of Benefit Arrival

Sahm et al. (2012) hypothesize that the reduced visibility of stimulus payments delivered as reduced withholdings led to a lower propensity to consume than equivalent payments delivered as a one-time check in the mail. Perhaps EBT made the moment of benefit arrival less salient, and led to a lower immediate propensity to consume. Perhaps this is more likely in households with kids because of the time and attention demands of parenting.

There are a couple pieces of evidence against a lack of salience. The first is anecdotal: midnight queues at grocery stores for SNAP disbursements are common in the EBT era, according to Maestri & Baertlein (2009). They quote the CFO of Wal-Mart as saying, "Once the clock strikes midnight and EBT cards are charged, you can see our results start to tick up." Additionally, even though benefits roll over across months, benefit exhaustion is rapid and near universal. J.P. Morgan (which administered EBT in 20 states at the time of the article) reports that 85% of SNAP funds are depleted within three days of disbursement (Maestri & Baertlein, 2009).

Finally, I find no evidence that EBT changes the likelihood of shopping on the first day of the benefit month, or that it does so in a way that depends on the number of children in a household. I regress a shopping indicator variable on an EBT indicator, the interaction between EBT and kids,

Table 9: Impact of EBT on Shopping
Likelihood at the Beginning of the Benefit Month

Sample Rest.:	$t = 0$			$t < 2$		
	(1)	(2)	(3)	(4)	(5)	(6)
EBT	0.06	0.00	0.02	-0.01	-0.06	-0.07
	(0.08)	(0.09)	(0.09)	(0.04)	(0.05)	(0.05)
# kids	0.02	0.01	0.02	0.03***	0.02*	0.02*
	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)
# kids X EBT	0.01	0.03	0.01	-0.01	0.00	-0.00
	(0.03)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)
# adults - 1	0.03	0.00	-0.00	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
# adults - 1 X EBT	-0.04	0.02	0.03	-0.02	0.04	0.04
	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)	(0.05)
Mean Dep. Var.	0.44	0.44	0.44	0.40	0.40	0.40
	[0.50]	[0.50]	[0.50]	[0.49]	[0.49]	[0.49]
Date Controls	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	Y	Y	N	Y	Y
Year FE	N	N	Y	N	N	Y
Clusters	38	38	38	39	39	39
N	438	438	438	915	915	915

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first day of the benefit month in columns (1)-(3), and the first two days of the benefit month in columns (4)-(6). It is also limited to households with twelve or fewer members, and a reported SNAP disbursement of at least $10. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income, and their interactions with EBT are included as controls in columns (2), (3), (5), and (6). Full results available in Appendix Table A21.

with year and state fixed effects, state-specific linear time trends, and control variables for the weekend, week of month and week of diary. Results are presented in Table 9. The coefficient on EBT is generally positive and is never statistically different from zero across specifications. The coefficient on the interaction between EBT and the number of children is very close to zero. For the primary recipient at least, it appears unlikely that SNAP reduced the salience of benefit arrival.[46]

[46] While there is clear evidence of benefit salience in the post-EBT era by at least one card user in a household, it could be that EBT made benefit arrival less salient only for others in the household. One way of tying stigma, benefit ownership, and salience all together is to suggest that parents feel benefit stigma with respect to their children. If EBT helped parents keep knowledge of their benefits private from their children, this could explain the shift in bargaining power. However, I cannot distinguish this particular mechanism from a more standard benefit ownership story.

5 Conclusion

Prior to EBT, failures to smooth monthly expenditures on food and caloric consumption were more severe for SNAP households with children than for other households. The main finding of this paper is that EBT smoothed the expenditure profiles of households with children. For a single parent with two children, mean shopping trip expenditures for the first four weeks of the benefit month before EBT were $61, $29, $19, and $18, respectively, and with EBT were $44, $45, $28, and $24, respectively. These smoother expenditures could have direct value to households by allowing them to avoid price congestion at the beginning of the month (Hastings & Washington, 2010). However, whether the impact of EBT on expenditure smoothing had large welfare impacts likely depends on whether smoother expenditures translate into smoother consumption. From an economic principles point of view, and making the strong assumption that all expenditures are consumed within a week, diminishing marginal utility implies that there were direct, positive welfare consequences of EBT if consumption was re-allocated along with expenditure. I perform a simple calibration exercise to determine for a single-parent with two children: how much larger would the pre-EBT food budget need to be to make up for the additional variance in expenditures?[47] The procedure implies a welfare gain from purely the smoothing impact of EBT that is equivalent to increasing food expenditures in each pre-EBT weekly shopping trip by 5%.

Even after the implementation of EBT, there remains a significant, homogeneous expenditure

[47] I take mean shopping trip expenditures for the first four weeks of the benefit month before EBT ($61, $29, $19, $18) and with EBT ($44, $45, $28, $24) and adjust them to sum to one in each policy period (these come from Panel B of Figure 3). I assume no discounting, and square-root utility over expenditures. I make this choice because Shapiro (2005) assumes log-utility over calories consumed in its model of consumption, but expenditures are more durable. I equate utility with EBT to utility before EBT, where each pre-EBT expenditure amount is multiplied by a common factor. Solving for the common factor yields 1.05. Assuming log utility instead, which is consistent with Shapiro (2005) if all purchases are consumed in the week following the shopping trip, increases the common factor to 1.21 and thus the gain from smoothing is equivalent to a 21% increase in the pre-EBT budget.

cycle as measured by food expenditure in the CES. Todd (2015) and Kuhn (2018) show that this remains true for consumption in the EBT era. Other interventions are clearly necessary if policy makers wish to further mitigate consumption cycles and their consequences. Todd (2015) shows that increased benefit amounts from the American Recovery and Reinvestment Act reduced the severity of consumption cycles. So, one interpretation of these cycles in consumption is that benefit amounts are just inadequate to feed a household all month. Parsons & Van Wesep (2013) suggest increasing disbursement frequency as a cost-neutral fix for volatile consumption. The benefit-ownership mechanism I outline here suggests that efforts to empower responsible recipients may also be an effective cost-neutral approach. Voluntary photo-EBT would offer primary recipients more control without the downsides of a mandatory policy.

While Sahm et al. (2012) show that payment frequency matters for tax rebate spending dynamics, this paper shows that the technique through which a single benefit event is disbursed affects the timing of subsequent expenditures. While all states have used EBT to disburse SNAP since 2004, and WIC benefits will soon be fully electronic, this finding is relevant to a large number of income and transfer programs where disbursement technique and recipient property rights may vary. For example, the EITC is a large U.S. cash welfare program that is disbursed once a year. This paper suggests that mailed checks and direct-deposited refunds may produce different spending dynamics, especially if a large fraction of mailed checks are cashed. Work in development economics has begun to address this issue (Schaner, 2016, 2015), but the relationship between disbursement technique and income use/transfer program efficacy is not well-studied despite a rapidly expanding set of digital financial tools that offer new ways to receive and manage income and benefits. Future work should examine the interaction between disbursement method and household structure for other types of income, and evaluate the potential for digital tools to improve targeted disbursement. Given recent advances in digital finance –e.g. smartphone payments, and integrated purchasing and budgeting tools– now is the time to re-think the way benefits are disbursed in order to reduce administrative costs, improve the user experience, obtain better participant outcomes (including consumption smoothing), and increase participation.

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A Appendix for Online Publication

A.1 Policy Changes during the Sample

As a part of its 1993 budget, Congress authorized the Mickey Leland Childhood Hunger Relief Act. Its main impact was to expand SNAP by adding and increasing deductions that households could use to determine eligibility.[48] As a result, the period prior to the 1996 welfare reform act is a period of relative program generosity with large enrollment.

The Personal Responsibility and Work Opportunities Reconciliation Act of 1996 (commonly referred to as just "welfare reform") introduced new restrictions. A time limit of three months of benefits within any three-year period was imposed for able-bodied adults without dependents (ABAWDs) with less than 20 hours per week of work, and states were given more power to disqualify SNAP recipients based on disqualification from other assistance programs.[49] These changes to the program came during a time of falling enrollment due to economic factors. From a high of 27.5 million households in 1994, enrollment fell to 17.2 million households in 2000.[50]

However, almost immediately following the passage of welfare reform, Congress began to undo some of its changes. By 1998, states were allowed to exempt 15% of the excluded underemployed

[48]Most notably, the cap on deductions for excess (above half of income) shelter expenses was scheduled for gradual elimination, Earned Income Tax Credit receipts in the previous year were made deductible, the age limit for the deduction of students' income was raised to 21, child support payments were made deductible, and certain vehicles were excluded from the asset test (`https://www.govtrack.us/congress/bills/103/hr529`).

[49]Other reductions in benefits/eligibility included: reducing the cost of living adjustments for benefits, freezing the growth some important deductions (including the shelter deduction cap), and removing legal immigrants from eligibility (`https://www.govtrack.us/congress/bills/104/hr3734`). School meal programs and the Women, Infants and Children (WIC) program were not altered by welfare reform, although WIC eligibility is tied to SNAP eligibility. The use of EBT for WIC did not begin long after the sample period with the exception of Wyoming in 2002 (`http://www.fns.usda.gov/wic/wic-ebt-activities`). Some changes were made to these programs in the William F. Goodling Child Nutrition Reauthorization Act of 1998, which made more federal money available for after-school program meals and snacks (Martin & Oakley, 2008).

[50]Data from the USDA Food and Nutrition Service, `http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap`.

ABAWDs.[51] The 2001 agriculture appropriations bill increased the shelter deduction cap and pegged it to inflation moving forward. The Food Security and Rural Investment Act of 2002 offered an expanded standard deduction for larger households and indexed it to inflation, in addition to restoring eligibility for some non-citizen households.[52] Enrollment grew to 21.3 million in 2003 at the end of my sample period.

A.2 Structural Estimation

I follow Shapiro (2005) and perform a calibration of a quasi-hyperbolic model of time preferences in order to assess whether the data generate present-bias estimates in line with the literature, whether the magnitudes of the parametrically-measured heterogeneity in present-bias and EBT effects are meaningful. First, I make a series of assumptions on the structure of the utility maximization problem. Consider a household whose budget for food is endowed every month and is isolated from all other purchases (the budget represents both SNAP receipt and outside income that will be used for food). The budget is exactly exhausted by the end of the four weeks following receipt and prices do not change. Households derive utility from the log of expenditures on food. The advantage to this setup is that observed expenditures translate directly into value of food consumed and log utility captures the fact that consuming no food is extraordinarily undesirable, but marginal utility decreases very quickly such that gourmet food is not worth starving for.

All the simplifying assumptions allow me to use the hyperbolic Euler equation from Harris & Laibson (2001),

$$\frac{c_{t+1}}{c_t} = \beta\delta c'(x_{t+1}) + \delta(1 - c'(x_{t+1})) \quad , \tag{3}$$

[51] See the USDA's Short History of SNAP, http://www.fns.usda.gov/snap/short-history-snap.
[52] https://www.govtrack.us/congress/bills/107/hr2646.

where consumption levels, c_t are expressed as functions of the current wealth stock, x_t, and β and δ are the present-bias parameter and exponential discount factor from the quasi-hyperbolic model of discounting. Shapiro (2005) shows that this can be expressed as a recursive equation,

$$\alpha_t = \begin{cases} \frac{\alpha_{t+1}}{\alpha_{t+1}+(\delta(1-(1-\beta)\alpha_{t+1}))} & \text{if } t < T \\ 1 & \text{if } t = T \end{cases}, \tag{4}$$

where T represents the last period and α_t is the fraction of wealth spent on consumption in period t. I use non-linear least squares to estimate the recursion.[53]

As with Shapiro (2005), I assume $\delta = 1$ over such a short time horizon. Because the estimation depends on a well-defined, positive recursion, I use the predicted values from a fixed-effects Poisson model of expenditures over the food-stamp month to generate complete and positive monthly profiles of expenditures relative to day zero (household income and SNAP benefit amount interacted with t and both t and EBT are included as control variables). I do not condition this sample on non-zero expenditures because the predicted values are meant to approximate consumption. By # of kids $\times EBT$ cell, I collapse to the median expenditure prediction across control variables. Expenditures on day 29 are assumed the fully exhaust the food budget, and the α_t variables are constructed recursively. I then estimate equation (4) on days zero to 28 of the benefit month, separately by EBT status and whether there are kids in the household.

[53] I transform β to $\Phi(\beta)$ to ensure $\beta \in (0, 1)$.

A.3 Supplementary Tables

Table A1: Policy Variables and EBT Status

Dep. Var.:	SNAP Cases (1)	TANF Cases (2)	SNAP Disb. (3)	SNAP Disb.Range (4)	SNAP Rate (5)
	Panel A: Unconditional Means				
EBT	-0.012***	-0.023***	-0.768	-2.049**	-0.067***
	(0.004)	(0.003)	(0.476)	(0.802)	(0.016)
	Panel B: Means with Year Fixed Effects				
EBT	0.006	-0.009**	0.051	-0.348	0.011
	(0.006)	(0.004)	(0.678)	(1.171)	(0.024)
	Panel C: Means with Year and State Fixed Effects, and State-specific Linear Time Trends				
EBT	0.001	-0.000	-0.214	0.587	0.001
	(0.003)	(0.002)	(0.578)	(1.217)	(0.013)
Mean Dep. Var.	0.079	0.031	6.395	8.43	0.644
[SD]	[0.025]	[0.018]	[5.889]	[6.773]	[0.114]
Clusters	40	41	41	36	41
N	1,470	1,473	1,680	435	327

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Estimates are from OLS regressions of the dependent variable on EBT completion status. Standard errors in parentheses are clustered at the state level. All specifications in Panel B feature year fixed effects, with 1994 as the excluded year. All specifications in Panel C feature year fixed effects, with 1994 as the excluded year, state fixed effects with California as the excluded state, and state-specific linear time trends. SNAP (TANF) Caseload is the fraction of individuals in a state enrolled in SNAP (TANF) in any given month. SNAP Disbursement is the calendar disbursement day, and SNAP Disbursement Range is the state-biannual maximum calendar disbursement day minus the minimum. SNAP Rate is the estimated fraction of eligible individuals participating in SNAP in a given state-year.

Table A2: Impact of EBT on Food Expenditure Cycles, Shopping Days Only

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)	(6)
t	-2.88***	-1.59***	-1.42**	-2.05**	-2.05**	-2.64***
	(0.39)	(0.42)	(0.55)	(0.77)	(0.80)	(0.81)
t X EBT	0.41	-0.70*	-0.61	-0.45	-1.12	-1.06
	(0.28)	(0.37)	(0.57)	(0.71)	(0.68)	(0.76)
t X # kids		-0.70***	-0.78***	-0.78***	-0.77***	-0.74***
		(0.17)	(0.19)	(0.19)	(0.21)	(0.22)
t X # kids X EBT		0.62***	0.85***	0.90***	0.90***	1.10***
		(0.19)	(0.26)	(0.27)	(0.30)	(0.34)
t X # adults - 1			-0.19	-0.13	-0.24	-0.29
			(0.42)	(0.41)	(0.40)	(0.42)
t X # adults - 1 X EBT			-0.28	-0.41	-0.44	-0.37
			(0.47)	(0.46)	(0.48)	(0.49)
t X SNAP benefit (100s '17 $)			0.09	0.13	0.14	0.15
			(0.24)	(0.24)	(0.24)	(0.24)
t X SNAP benefit X EBT			-0.26	-0.32	-0.35	-0.52
			(0.30)	(0.29)	(0.31)	(0.34)
t X income (1000s '17 $)			0.02	0.02	0.02	0.02
			(0.02)	(0.02)	(0.02)	(0.02)
t X income X EBT			-0.02	-0.01	-0.01	-0.02
			(0.02)	(0.02)	(0.02)	(0.02)
Weekend	2.11	2.25*	2.31*	2.27*	2.09	1.98
	(1.30)	(1.27)	(1.29)	(1.33)	(1.36)	(1.39)
Week of month	-1.37*	-1.50*	-1.50*	-1.64**	-1.26*	-1.32*
	(0.73)	(0.75)	(0.76)	(0.78)	(0.71)	(0.75)
Diary week	13.95***	13.93***	13.88***	13.98***	14.18***	14.20***
	(2.76)	(2.77)	(2.78)	(2.79)	(2.80)	(2.84)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A3: Impact of EBT on Food Expenditure Cycles, Likelihood of Shopping

Mean Dep. Var.: 0.317 [0.465]	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.033***	-0.033***	-0.035***	-0.032***	-0.032***	-0.034***
	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
t X EBT	0.001	0.000	0.002	0.005	0.005	0.007
	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)	(0.005)
t X # kids		-0.000	0.001	0.001	0.001	0.002*
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
t X # kids X EBT		0.000	-0.001	-0.001	-0.001	-0.001
		(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
t X # adults - 1			0.001	0.001	0.001	0.001
			(0.001)	(0.001)	(0.001)	(0.001)
t X # adults - 1 X EBT			-0.001	-0.001	-0.001	-0.000
			(0.002)	(0.002)	(0.002)	(0.003)
t X SNAP benefit (100s '17 $)			-0.002*	-0.002**	-0.002**	-0.002**
			(0.001)	(0.001)	(0.001)	(0.001)
t X SNAP benefit X EBT			0.002	0.002	0.002	0.002
			(0.001)	(0.001)	(0.001)	(0.001)
t X income (1000s '17 $)			0.000	0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)
t X income X EBT			0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Weekend	-0.018**	-0.018**	-0.018**	-0.018**	-0.018**	-0.018**
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Week of month	-0.006	-0.006	-0.006	-0.006	-0.006	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Diary week	0.206***	0.206***	0.206***	0.206***	0.206***	0.206***
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	17,665	17,665	17,665	17,665	17,665	17,665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A4: Impact of EBT on Food Expenditure Cycles, Total Effect

Mean Dep. Var.: 11.73 [34.45]	(1)	(2)	(3)	(4)	(5)	(6)
t	-2.77***	-2.29***	-2.21***	-2.35***	-2.17***	-2.49***
	(0.19)	(0.20)	(0.22)	(0.30)	(0.38)	(0.32)
t X EBT	0.10	-0.08	0.01	0.19	0.16	0.22
	(0.10)	(0.13)	(0.21)	(0.26)	(0.25)	(0.27)
t X # kids		-0.29***	-0.25***	-0.25***	-0.26***	-0.25***
		(0.07)	(0.07)	(0.07)	(0.08)	(0.09)
t X # kids X EBT		0.10	0.11	0.12	0.11	0.10
		(0.10)	(0.13)	(0.14)	(0.15)	(0.15)
t X # adults - 1			-0.15	-0.14	-0.19	-0.22
			(0.15)	(0.14)	(0.13)	(0.14)
t X # adults - 1 X EBT			-0.17	-0.18	-0.16	-0.08
			(0.20)	(0.19)	(0.20)	(0.20)
t X SNAP benefit (100s '17 $)			-0.06	-0.05	-0.05	-0.05
			(0.09)	(0.09)	(0.10)	(0.10)
t X SNAP benefit X EBT			0.01	-0.01	-0.01	-0.03
			(0.15)	(0.15)	(0.16)	(0.17)
t X income (1000s '17 $)			0.01	0.01	0.01	0.01
			(0.01)	(0.01)	(0.01)	(0.01)
t X income X EBT			-0.00	-0.00	-0.00	-0.00
			(0.01)	(0.01)	(0.01)	(0.01)
Weekend	0.19	0.20	0.20	0.21	0.20	0.19
	(0.65)	(0.65)	(0.65)	(0.66)	(0.65)	(0.66)
Week of month	-0.90**	-0.89**	-0.90**	-0.90**	-0.85**	-0.84**
	(0.35)	(0.36)	(0.37)	(0.37)	(0.37)	(0.38)
Diary week	16.47***	16.47***	16.46***	16.47***	16.48***	16.48***
	(1.35)	(1.35)	(1.35)	(1.35)	(1.35)	(1.35)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	17,665	17,665	17,665	17,665	17,665	17,665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A5: Impact of EBT on Quadratic Food Expenditure Cycles, Shopping Days Only

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)	(6)
t	-4.30***	-2.39**	-1.46	-2.12	-2.16	-2.76
	(0.76)	(1.08)	(1.36)	(1.50)	(1.58)	(1.70)
t^2	0.05***	0.03	0.00	0.01	0.01	0.01
	(0.02)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)
t X EBT	0.43	-1.71	-2.37	-2.17	-2.69	-2.41
	(0.94)	(1.19)	(1.66)	(1.69)	(1.81)	(1.68)
t^2 X EBT	-0.00	0.03	0.06	0.06	0.05	0.04
	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
t X # kids		-1.14**	-1.07	-1.04	-1.07	-1.07
		(0.49)	(0.66)	(0.66)	(0.71)	(0.74)
t^2 X # kids		0.01	0.01	0.01	0.01	0.01
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
t X # kids X EBT		1.29**	1.66**	1.67**	1.63**	1.72**
		(0.57)	(0.77)	(0.72)	(0.78)	(0.82)
t^2 X # kids X EBT		-0.02	-0.03	-0.03	-0.03	-0.02
		(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
t X # adults - 1			-1.30*	-1.25*	-1.26*	-1.19*
			(0.69)	(0.67)	(0.68)	(0.70)
t^2 X # adults - 1			0.04	0.04	0.03	0.03
			(0.02)	(0.02)	(0.02)	(0.02)
t X # adults - 1 X EBT			0.36	0.13	0.22	-0.09
			(1.18)	(1.18)	(1.21)	(1.20)
t^2 X # adults - 1 X EBT			-0.02	-0.02	-0.02	-0.01
			(0.04)	(0.04)	(0.04)	(0.04)
t X SNAP benefit (100s '17 $)			-0.43	-0.39	-0.40	-0.38
			(0.55)	(0.55)	(0.57)	(0.57)
t^2 X SNAP benefit			0.02	0.02	0.02	0.02
			(0.02)	(0.02)	(0.02)	(0.02)
t X SNAP benefit X EBT			-0.12	-0.19	-0.09	-0.11
			(0.69)	(0.69)	(0.72)	(0.76)
t^2 X SNAP benefit X EBT			-0.01	-0.00	-0.01	-0.01
			(0.02)	(0.02)	(0.02)	(0.02)
t X income (1000s '17 $)			0.09*	0.09*	0.09*	0.09*
			(0.05)	(0.05)	(0.05)	(0.05)
t^2 X income			-0.00	-0.00	-0.00	-0.00
			(0.00)	(0.00)	(0.00)	(0.00)
t X income X EBT			-0.05	-0.05	-0.05	-0.04
			(0.06)	(0.06)	(0.06)	(0.06)
t^2 X income X EBT			0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)
Weekend	2.18	2.31*	2.34*	2.31*	2.15	2.04
	(1.31)	(1.29)	(1.29)	(1.32)	(1.34)	(1.38)
Week of month	-0.27	-0.36	-0.27	-0.41	-0.05	-0.06
	(0.91)	(0.95)	(0.91)	(0.93)	(0.88)	(0.89)
Diary week	13.93***	13.91***	13.85***	13.95***	14.15***	14.12***
	(2.75)	(2.76)	(2.75)	(2.76)	(2.77)	(2.80)
Date Controls	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	N	Y	Y	Y	Y
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5595	5595	5595	5595	5595	5595

$^{***} \Rightarrow p < 0.01$, $^{**} \Rightarrow p < 0.05$, $^{*} \Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income interacted with t, and their triple interactions with EBT are included as controls in columns (3)-(6).

Table A6: Impact of EBT on Food
Expenditure per Capita Cycles, Shopping Days Only

Mean Dep. Var.: 12.79 [19.55]	(1)	(2)	(3)	(4)	(5)	(6)
t	-1.10***	-1.66*	-0.89***	-0.81***	-0.90***	-0.80*
	(0.24)	(0.86)	(0.21)	(0.19)	(0.23)	(0.40)
t X EBT	0.05	-0.14	0.06	0.22*	0.43***	0.94***
	(0.11)	(0.36)	(0.14)	(0.13)	(0.14)	(0.24)
t X # adults - 1	0.03	0.11	0.01	-0.08	-0.18**	-0.35***
	(0.05)	(0.20)	(0.05)	(0.07)	(0.07)	(0.09)
t X SNAP benefit (100s '17 $)	0.02	0.07	0.00	-0.01	-0.03	-0.01
	(0.03)	(0.14)	(0.03)	(0.03)	(0.04)	(0.05)
t X income (1000s '17 $)	0.00	-0.00	0.00	0.00	0.01*	0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Weekend	0.86*	2.27*	0.42	0.50	0.55	0.12
	(0.51)	(1.23)	(0.41)	(0.44)	(0.55)	(0.49)
Week of month	-0.44*	-0.59	-0.46**	-0.46*	-0.71**	-0.57
	(0.22)	(0.63)	(0.20)	(0.24)	(0.32)	(0.37)
Diary week	4.14***	7.64***	2.98***	3.42***	3.82***	3.87***
	(0.87)	(2.55)	(0.72)	(0.84)	(1.13)	(1.37)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

$^{***} \Rightarrow p < 0.01$, $^{**} \Rightarrow p < 0.05$, $^{*} \Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A7: Impact of EBT on Food Expenditure per SNAP $, Shopping Days Only

Mean Dep. Var.: 0.261 [0.655]	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.067***	-0.056***	-0.062***	-0.067***	-0.072***	-0.068***
	(0.010)	(0.010)	(0.010)	(0.015)	(0.015)	(0.012)
t X EBT	0.012*	0.004	0.016	0.011	-0.005	-0.008
	(0.007)	(0.013)	(0.014)	(0.016)	(0.018)	(0.020)
t X # kids		-0.006*	-0.009**	-0.010***	-0.010**	-0.008**
		(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
t X # kids X EBT		0.005	0.009	0.010*	0.010*	0.011**
		(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
t X # adults - 1			0.011*	0.012*	0.010	0.009
			(0.006)	(0.007)	(0.007)	(0.007)
t X # adults - 1 X EBT			-0.020**	-0.022**	-0.023**	-0.020*
			(0.010)	(0.010)	(0.010)	(0.010)
t X SNAP benefit (100s '17 $)			0.004	0.005	0.006	0.005
			(0.004)	(0.004)	(0.004)	(0.004)
t X SNAP benefit X EBT			-0.004	-0.004	-0.005	-0.006
			(0.005)	(0.005)	(0.005)	(0.006)
t X income (1000s '17 $)			0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
t X income X EBT			-0.000	-0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Weekend	0.033	0.034	0.033	0.033	0.027	0.027
	(0.032)	(0.032)	(0.032)	(0.033)	(0.034)	(0.034)
Week of month	-0.034	-0.035	-0.035	-0.039*	-0.033	-0.032
	(0.020)	(0.021)	(0.022)	(0.022)	(0.021)	(0.021)
Diary week	0.348***	0.347***	0.348***	0.349***	0.353***	0.353***
	(0.067)	(0.067)	(0.067)	(0.067)	(0.068)	(0.068)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A8: Impact of EBT on Log Food Expenditure Cycles, Shopping Days Only

Mean Dep. Var.: 2.879 [1.231]	(1)	(2)	(3)	(4)	(5)	(6)
t	-0.067***	-0.056***	-0.062***	-0.067***	-0.072***	-0.068***
	(0.010)	(0.010)	(0.010)	(0.015)	(0.015)	(0.012)
t X EBT	0.012*	0.004	0.016	0.011	-0.005	-0.008
	(0.007)	(0.013)	(0.014)	(0.016)	(0.018)	(0.020)
t X # kids		-0.006*	-0.009**	-0.010***	-0.010**	-0.008**
		(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
t X # kids X EBT		0.005	0.009	0.010*	0.010*	0.011**
		(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
t X # adults - 1			0.011*	0.012*	0.010	0.009
			(0.006)	(0.007)	(0.007)	(0.007)
t X # adults - 1 X EBT			-0.020**	-0.022**	-0.023**	-0.020*
			(0.010)	(0.010)	(0.010)	(0.010)
t X SNAP benefit (100s '17 $)			0.004	0.005	0.006	0.005
			(0.004)	(0.004)	(0.004)	(0.004)
t X SNAP benefit X EBT			-0.004	-0.004	-0.005	-0.006
			(0.005)	(0.005)	(0.005)	(0.006)
t X income (1000s '17 $)			0.000	0.000	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
t X income X EBT			-0.000	-0.000	-0.000	-0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Weekend	0.033	0.034	0.033	0.033	0.027	0.027
	(0.032)	(0.032)	(0.032)	(0.033)	(0.034)	(0.034)
Week of month	-0.034	-0.035	-0.035	-0.039*	-0.033	-0.032
	(0.020)	(0.021)	(0.022)	(0.022)	(0.021)	(0.021)
Diary week	0.348***	0.347***	0.348***	0.349***	0.353***	0.353***
	(0.067)	(0.067)	(0.067)	(0.067)	(0.068)	(0.068)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A9: Impact of EBT on Food Expenditure Cycles,
Shopping Days Only, by SNAP-Disbursement Calendar Week

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)	(6)	(7)
t	-2.45***	-2.52***	-1.54***	-1.38**	-2.00**	-2.15**	-2.64**
	(0.38)	(0.44)	(0.52)	(0.64)	(0.84)	(0.91)	(1.00)
t X SNAP week	-0.42*	-0.55	-0.08	-0.13	-0.15	-0.31	-0.34
	(0.22)	(0.34)	(0.45)	(0.47)	(0.49)	(0.52)	(0.56)
t X EBT		0.13	-0.95*	-0.80	-0.57	-1.34	-1.28
		(0.39)	(0.50)	(0.69)	(0.84)	(0.89)	(0.95)
t X SNAP week X EBT		0.44	0.56	0.53	0.52	0.62	0.61
		(0.48)	(0.50)	(0.51)	(0.56)	(0.56)	(0.69)
t X # kids			-0.53***	-0.60**	-0.61**	-0.59*	-0.59
			(0.20)	(0.28)	(0.30)	(0.33)	(0.36)
t X # kids X SNAP week			-0.24	-0.21	-0.21	-0.19	-0.17
			(0.21)	(0.21)	(0.22)	(0.22)	(0.22)
t X # kids X EBT			0.60***	0.82**	0.87**	0.90**	1.12**
			(0.22)	(0.34)	(0.36)	(0.42)	(0.46)
t X # kids X SNAP week X EBT			-0.10	-0.12	-0.12	-0.21	-0.19
			(0.33)	(0.33)	(0.36)	(0.35)	(0.39)
t X # adults - 1				-0.15	-0.09	-0.19	-0.22
				(0.39)	(0.38)	(0.37)	(0.38)
t X # adults - 1 X EBT				-0.32	-0.44	-0.50	-0.44
				(0.45)	(0.44)	(0.44)	(0.46)
t X SNAP benefit (100s '17 $)				0.04	0.09	0.09	0.11
				(0.25)	(0.24)	(0.25)	(0.25)
t X SNAP benefit X EBT				-0.21	-0.28	-0.30	-0.47
				(0.30)	(0.30)	(0.32)	(0.36)
t X income (1000s '17 $)				0.02	0.02	0.02	0.02
				(0.02)	(0.02)	(0.02)	(0.02)
t X income X EBT				-0.01	-0.01	-0.01	-0.02
				(0.02)	(0.02)	(0.02)	(0.02)
Weekend	2.13	2.13	2.21*	2.27*	2.23*	2.04	1.95
	(1.30)	(1.31)	(1.25)	(1.28)	(1.32)	(1.35)	(1.39)
Week of month	-1.86**	-1.86**	-2.01***	-2.03***	-2.17***	-1.91**	-1.91**
	(0.77)	(0.78)	(0.73)	(0.74)	(0.77)	(0.73)	(0.75)
Diary week	14.00***	13.96***	13.85***	13.81***	13.92***	14.14***	14.16***
	(2.76)	(2.75)	(2.76)	(2.77)	(2.78)	(2.78)	(2.82)
Date Controls	Y	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	N	N	Y	Y	Y	Y
Year FE X t	N	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595	5,596

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. SNAP week refers to the week-of-month in which benefits arrive, equal to zero in the first week of the month. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income interacted with t, and their triple interactions with EBT are included as controls in columns (3)-(6).

Table A10: Impact of EBT on Per-capita Food Expenditure Cycles by # of Kids, Shopping Days Only

Household type:	All	$k = 0$	$k > 0$	$k > 1$	$k > 2$	$k > 3$
	(1)	(2)	(3)	(4)	(5)	(6)
t	-1.08***	-1.53**	-0.88***	-0.87***	-1.03***	-1.07***
	(0.23)	(0.75)	(0.21)	(0.19)	(0.23)	(0.37)
t X EBT	0.05	-0.13	0.06	0.21	0.29**	0.61***
	(0.11)	(0.35)	(0.14)	(0.13)	(0.13)	(0.20)
t X SNAP benefit (100s '17 $)	0.02	0.09	0.00	-0.01	-0.03	0.00
	(0.03)	(0.14)	(0.03)	(0.03)	(0.04)	(0.05)
t X income (1000s '17 $)	0.00	0.00	0.00*	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Weekend	0.86*	2.30*	0.43	0.48	0.55	0.21
	(0.51)	(1.22)	(0.41)	(0.44)	(0.55)	(0.50)
Week of month	-0.45*	-0.59	-0.46**	-0.44*	-0.69**	-0.59
	(0.22)	(0.63)	(0.20)	(0.24)	(0.32)	(0.38)
Diary week	4.14***	7.62***	2.98***	3.44***	3.85***	3.95***
	(0.87)	(2.55)	(0.72)	(0.84)	(1.14)	(1.37)
Mean Dep. Var.	12.79	20.74	9.67	9.09	8.52	7.57
[SD]	[19.55]	[27.34]	[14.30]	[13.44]	[12.08]	[10.22]
Year FE X t	Y	Y	Y	Y	Y	Y
Clusters	41	40	41	41	38	30
N	5,595	1,578	4017	2952	1684	825

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A11: Impact of EBT on Food
Expenditure Cycles, Shopping Days Only, Child Age Groups

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)
t	-1.58***	-1.40**	-2.02**	-2.05**	-2.53***
	(0.42)	(0.55)	(0.77)	(0.82)	(0.83)
t X EBT	-0.66*	-0.61	-0.44	-1.11	-1.09
	(0.39)	(0.58)	(0.68)	(0.69)	(0.78)
t X # kids under 6	-0.71**	-0.83***	-0.82***	-0.78**	-0.87***
	(0.27)	(0.29)	(0.28)	(0.30)	(0.32)
t X # kids 6-12	-0.80**	-0.88***	-0.85***	-0.88**	-0.74**
	(0.35)	(0.31)	(0.31)	(0.33)	(0.35)
t X # kids 13-17	-0.52	-0.60	-0.66	-0.59	-0.59
	(0.36)	(0.41)	(0.40)	(0.43)	(0.45)
t X # kids under 6 X EBT	0.57	0.86*	0.86**	0.76	1.14**
	(0.42)	(0.43)	(0.42)	(0.48)	(0.54)
t X # kids 6-12 X EBT	0.94**	1.08***	1.09***	1.21***	1.26***
	(0.39)	(0.37)	(0.36)	(0.36)	(0.41)
t X # kids 13-17 X EBT	0.08	0.36	0.51	0.39	0.66
	(0.51)	(0.54)	(0.52)	(0.56)	(0.62)
t X # adults - 1		-0.19	-0.13	-0.24	-0.30
		(0.43)	(0.42)	(0.42)	(0.42)
t X # adults - 1 X EBT		-0.25	-0.38	-0.39	-0.33
		(0.49)	(0.47)	(0.49)	(0.50)
t X SNAP benefit (100s '17 $)		0.10	0.14	0.15	0.16
		(0.23)	(0.23)	(0.23)	(0.23)
t X SNAP benefit X EBT		-0.25	-0.30	-0.32	-0.50
		(0.27)	(0.26)	(0.28)	(0.31)
t X income (1000s '17 $)		0.02	0.02	0.02	0.02
		(0.02)	(0.02)	(0.02)	(0.02)
t X income X EBT		-0.02	-0.01	-0.01	-0.02
		(0.02)	(0.02)	(0.02)	(0.02)
Weekend	2.24*	2.31*	2.26*	2.08	1.97
	(1.25)	(1.27)	(1.31)	(1.34)	(1.38)
Week of month	-1.49**	-1.49**	-1.62**	-1.24*	-1.30*
	(0.74)	(0.73)	(0.76)	(0.69)	(0.73)
Diary week	13.92***	13.87***	13.97***	14.18***	14.19***
	(2.78)	(2.78)	(2.80)	(2.81)	(2.85)
Year FE X t	N	N	Y	Y	Y
State FE X t	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	Y
Clusters	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A12: Impact of EBT on Food Expenditure
Cycles, EBT Rollout Period Excluded, Shopping Days Only

Mean Dep. Var.: 36.53 [52.46]	(1)	(2)	(3)	(4)	(5)	(6)
t	-2.87***	-1.34***	-1.34**	-1.83**	-1.71*	-2.48***
	(0.44)	(0.48)	(0.60)	(0.86)	(0.88)	(0.90)
t X EBT	0.55*	-0.78*	-0.43	-0.04	-0.86	-0.11
	(0.32)	(0.44)	(0.62)	(0.80)	(1.00)	(1.23)
t X # kids		-0.81***	-0.81***	-0.81***	-0.84***	-0.80***
		(0.19)	(0.22)	(0.23)	(0.24)	(0.26)
t X # kids X EBT		0.71***	0.85***	0.93***	0.98***	1.11***
		(0.24)	(0.29)	(0.31)	(0.32)	(0.36)
t X # adults - 1			-0.06	0.00	-0.12	-0.08
			(0.46)	(0.45)	(0.45)	(0.48)
t X # adults - 1 X EBT			-0.50	-0.65	-0.61	-0.69
			(0.54)	(0.54)	(0.56)	(0.57)
t X SNAP benefit (100s '17 $)			-0.03	0.01	0.04	0.05
			(0.29)	(0.29)	(0.30)	(0.30)
t X SNAP benefit X EBT			-0.15	-0.22	-0.25	-0.39
			(0.35)	(0.35)	(0.36)	(0.39)
t X income (1000s '17 $)			0.02	0.02	0.02	0.02
			(0.02)	(0.02)	(0.02)	(0.02)
t X income X EBT			-0.01	-0.01	-0.01	-0.01
			(0.02)	(0.02)	(0.03)	(0.03)
Weekend	1.41	1.48	1.56	1.54	1.37	1.18
	(1.46)	(1.40)	(1.42)	(1.46)	(1.50)	(1.51)
Week of month	-1.34*	-1.12	-1.16	-1.28	-0.98	-1.11
	(0.70)	(0.75)	(0.75)	(0.79)	(0.80)	(0.84)
Diary week	13.23***	13.08***	13.05***	13.16***	13.39***	13.41***
	(3.26)	(3.23)	(3.23)	(3.24)	(3.31)	(3.35)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	4,779	4,779	4,779	4,779	4,779	4,779

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A13: Impact of EBT on Food Expenditure Cycles for
Mandatory Adopting States with Observed Policy Change, Shopping Days Only

Mean Dep. Var.: 37.39 [53.98]	(1)	(2)	(3)	(4)	(5)	(6)
t	-3.14***	-1.93***	-1.79**	-2.46**	1.36	0.80
	(0.47)	(0.50)	(0.68)	(1.01)	(1.72)	(2.18)
t X EBT	0.22	-0.72	-0.54	-0.26	-0.14	-0.18
	(0.35)	(0.45)	(0.72)	(0.84)	(0.90)	(1.01)
t X # kids		-0.76***	-0.72**	-0.74***	-0.70**	-0.66**
		(0.21)	(0.27)	(0.25)	(0.26)	(0.28)
t X # kids X EBT		0.63**	0.92***	0.94***	0.98***	1.25***
		(0.27)	(0.33)	(0.33)	(0.33)	(0.36)
t X # adults - 1			-0.21	-0.18	-0.15	-0.09
			(0.54)	(0.53)	(0.53)	(0.53)
t X # adults - 1 X EBT			-0.53	-0.54	-0.68	-0.76
			(0.67)	(0.67)	(0.71)	(0.72)
t X SNAP benefit (100s '17 $)			-0.05	0.01	0.01	0.03
			(0.26)	(0.25)	(0.27)	(0.27)
t X SNAP benefit X EBT			-0.40	-0.46	-0.50	-0.72**
			(0.29)	(0.31)	(0.30)	(0.32)
t X income (1000s '17 $)			0.01	0.01	0.00	0.00
			(0.01)	(0.01)	(0.01)	(0.01)
t X income X EBT			-0.00	-0.00	0.00	-0.00
			(0.02)	(0.02)	(0.02)	(0.02)
Weekend	2.47	2.53	2.56	2.56	2.35	2.14
	(1.67)	(1.65)	(1.67)	(1.68)	(1.72)	(1.79)
Week of month	-1.35	-1.56	-1.56	-1.74	-1.42	-1.51
	(0.96)	(0.92)	(0.95)	(1.06)	(0.97)	(1.00)
Diary week	16.55***	16.51***	16.43***	16.53***	16.77***	16.81***
	(3.57)	(3.59)	(3.59)	(3.60)	(3.60)	(3.64)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	33	33	33	33	33	33
N	4,080	4,080	4,080	4,080	4,080	4,080

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and New York is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A14: Impact of EBT on Food Expenditure
Cycles, with Welfare Reform, Shopping Days Only

Mean Dep. Var.: 37.81 [54.19]	(1)	(2)	(3)	(4)	(5)	(6)
t	-3.99***	-1.91***	-1.75**	-2.04**	-1.34	-2.11**
	(0.75)	(0.54)	(0.67)	(0.84)	(0.91)	(0.82)
t X EBT	2.80***	1.69***	2.06***	1.73**	0.21	-0.79
	(0.39)	(0.54)	(0.72)	(0.71)	(0.79)	(0.99)
welrefXdss	1.31	0.18	0.17	-0.41	-0.47	2.67
	(0.82)	(0.53)	(0.53)	(1.06)	(1.09)	(2.29)
welrefXebtXdss	-2.15***	-2.32***	-2.51***	-2.12***	-0.77	0.68
	(0.52)	(0.54)	(0.61)	(0.69)	(0.73)	(0.83)
t X # kids		-0.68***	-0.75***	-0.77***	-0.79***	-0.74***
		(0.22)	(0.24)	(0.22)	(0.24)	(0.25)
t X # kids X EBT		0.61**	0.83***	0.88***	0.87***	1.06***
		(0.24)	(0.29)	(0.29)	(0.32)	(0.34)
t X # adults - 1			-0.17	-0.13	-0.29	-0.47
			(0.50)	(0.49)	(0.46)	(0.45)
t X # adults - 1 X EBT			-0.42	-0.51	-0.43	-0.32
			(0.57)	(0.55)	(0.54)	(0.53)
t X SNAP benefit (100s '17 $)			0.08	0.11	0.15	0.14
			(0.27)	(0.26)	(0.27)	(0.27)
t X SNAP benefit X EBT			-0.25	-0.28	-0.32	-0.42
			(0.32)	(0.32)	(0.35)	(0.37)
t X income (1000s '17 $)			0.02	0.02	0.02	0.02
			(0.02)	(0.02)	(0.02)	(0.02)
t X income X EBT			-0.01	-0.01	-0.01	-0.01
			(0.02)	(0.02)	(0.02)	(0.02)
Weekend	-0.52	2.71**	2.76**	2.76**	2.51*	2.44*
	(2.59)	(1.23)	(1.23)	(1.26)	(1.30)	(1.33)
Week of month	-2.27***	-1.68**	-1.69**	-1.77**	-1.24*	-1.43**
	(0.81)	(0.66)	(0.67)	(0.67)	(0.66)	(0.70)
Diary week	21.99***	14.12***	14.04***	14.04***	14.39***	14.40***
	(4.99)	(3.17)	(3.20)	(3.20)	(3.26)	(3.31)
	(3.74)	(3.76)	(3.79)	(3.80)	(3.86)	(3.87)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	33
N	4,717	4,717	4,717	4,717	4,717	4,717

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to prior to the beginning of welfare reform in October 1996, and after the completion in February 1998, the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. Welfare Reform is an indicator variable for post February 2008, when all states completed their refore. All specifications feature household fixed effects. 1994 is the excluded year and New York is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A15: Impact of EBT on Food Expenditure
Cycles with Children-Year Fixed Effects, Shopping Days Only

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)
t	-1.24	-1.05	-1.81
	(0.94)	(1.04)	(1.08)
t X EBT	-0.97	-1.41*	-1.50*
	(0.74)	(0.78)	(0.83)
t X # kids	-1.27***	-1.30***	-1.18**
	(0.41)	(0.45)	(0.45)
t X # kids X EBT	1.20***	1.08**	1.32**
	(0.42)	(0.49)	(0.53)
t X # adults - 1	-0.11	-0.25	-0.31
	(0.38)	(0.39)	(0.42)
t X # adults - 1 X EBT	-0.44	-0.41	-0.32
	(0.48)	(0.49)	(0.51)
t X SNAP benefit (100s '17 $)	0.19	0.21	0.20
	(0.21)	(0.21)	(0.22)
t X SNAP benefit X EBT	-0.42	-0.44	-0.61
	(0.30)	(0.33)	(0.37)
t X income (1000s '17 $)	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)
t X income X EBT	-0.01	-0.01	-0.02
	(0.02)	(0.02)	(0.02)
Weekend	2.33*	2.16	2.03
	(1.31)	(1.34)	(1.39)
Week of month	-1.57*	-1.19	-1.24*
	(0.78)	(0.71)	(0.74)
Diary week	14.06***	14.26***	14.29***
	(2.81)	(2.82)	(2.86)
# children X Year FE X t	Y	Y	Y
Year FE X t	Y	Y	Y
State FE X t	N	Y	Y
State-Year Time Trend X t	N	N	Y
Clusters	41	41	41
N	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A16: Impact of EBT on Food Expenditure Cycles, Shopping Days Only, with SNAP-Ed

Mean Dep. Var.: 37.00 [53.04]	(1)	(2)	(3)	(4)	(5)	(6)
t	-1.41**	-1.32**	-1.82**	-1.49***	-1.39**	-1.88**
	(0.53)	(0.62)	(0.75)	(0.53)	(0.62)	(0.76)
t X EBT	-0.64*	-0.54	-0.34	-0.68*	-0.58	-0.34
	(0.35)	(0.57)	(0.69)	(0.34)	(0.57)	(0.69)
t X # kids	-0.87***	-0.91***	-0.92***	-0.84***	-0.89***	-0.89***
	(0.31)	(0.31)	(0.30)	(0.30)	(0.30)	(0.30)
t X # kids X EBT	0.54**	0.77***	0.82***	0.55***	0.79***	0.83***
	(0.21)	(0.27)	(0.27)	(0.20)	(0.26)	(0.27)
t X Any SNAP-Ed	-0.27	-0.18	-0.39			
	(0.37)	(0.39)	(0.48)			
t X Any SNAP-Ed X # kids	0.27	0.22	0.22			
	(0.34)	(0.33)	(0.33)			
t X SNAP-Ed funding ($ln(\$'17 + 1)$)				-0.01	-0.00	-0.01
				(0.02)	(0.03)	(0.03)
t X SNAP-Ed funding X # kids				0.02	0.01	0.01
				(0.02)	(0.02)	(0.02)
t X # adults - 1		-0.16	-0.11		-0.16	-0.11
		(0.41)	(0.40)		(0.41)	(0.40)
t X # adults - 1 X EBT		-0.31	-0.42		-0.31	-0.42
		(0.47)	(0.46)		(0.47)	(0.46)
t X SNAP benefit (100s '17 $)		0.09	0.13		0.09	0.13
		(0.25)	(0.24)		(0.25)	(0.24)
t X SNAP benefit X EBT		-0.24	-0.30		-0.25	-0.31
		(0.29)	(0.28)		(0.29)	(0.28)
t X income (1000s '17 $)		0.02	0.02		0.02	0.02
		(0.02)	(0.02)		(0.02)	(0.02)
t X income X EBT		-0.01	-0.01		-0.01	-0.01
		(0.02)	(0.02)		(0.02)	(0.02)
Weekend	2.22*	2.28*	2.26*	2.22*	2.28*	2.26*
	(1.26)	(1.28)	(1.32)	(1.27)	(1.29)	(1.32)
Week of month	-1.59**	-1.57*	-1.69**	-1.59**	-1.57*	-1.68**
	(0.77)	(0.78)	(0.81)	(0.77)	(0.78)	(0.80)
Diary week	13.93***	13.87***	13.98***	13.91***	13.86***	13.97***
	(2.78)	(2.79)	(2.80)	(2.79)	(2.79)	(2.80)
Year FE X t	N	N	Y	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses beneath the estimates, are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0. Any SNAP-Ed is an indicator variable for non-zero SNAP-Ed funding in a household's state, whereas SNAP-Ed funding is measured as the log of state funding (plus $1).

Table A17: Impact of EBT on SNAP-ineligible Expenditure Cycles, SNAP-eligible Shopping Days Only

Mean Dep. Var.: 89.80 [274.48]	(1)	(2)	(3)	(4)	(5)	(6)
t	-8.44**	-7.79**	-6.40*	-9.78***	-15.13***	-17.49***
	(3.12)	(3.50)	(3.71)	(3.40)	(4.64)	(3.85)
t X EBT	1.48	4.71	4.14	5.86	1.50	2.15
	(2.80)	(2.83)	(3.49)	(4.43)	(4.80)	(5.31)
t X # kids		-0.29	-2.07	-1.95	-2.02	-2.25
		(0.80)	(1.42)	(1.40)	(1.89)	(1.96)
t X # kids X EBT		-1.64	-0.70	-0.57	-0.64	-0.56
		(1.39)	(1.89)	(1.91)	(2.07)	(2.28)
t X # adults - 1			0.10	0.25	-0.29	-0.64
			(2.00)	(1.95)	(2.10)	(2.15)
t X # adults - 1 X EBT			0.73	0.34	0.08	0.23
			(2.70)	(2.59)	(2.88)	(2.80)
t X SNAP benefit (100s '17 $)			2.80*	2.96*	2.82*	2.80
			(1.44)	(1.50)	(1.65)	(1.67)
t X SNAP benefit X EBT			-1.17	-1.36	-1.11	-0.81
			(1.75)	(1.81)	(1.89)	(2.10)
t X income (1000s '17 $)			-0.09	-0.09	-0.08	-0.09
			(0.10)	(0.09)	(0.11)	(0.11)
t X income X EBT			-0.29	-0.30	-0.27	-0.25
			(0.22)	(0.21)	(0.22)	(0.23)
Weekend	-12.74	-12.83	-12.33	-12.15	-13.05	-14.15
	(9.09)	(9.02)	(8.89)	(8.99)	(9.13)	(9.04)
Week of month	-16.06*	-15.96*	-15.73*	-15.84	-13.67	-12.65
	(9.23)	(9.29)	(9.21)	(9.62)	(10.66)	(10.86)
Diary week	38.51***	37.61***	37.38***	37.93***	37.72***	35.81**
	(13.78)	(13.60)	(13.58)	(13.52)	(13.48)	(13.43)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

$^{***} \Rightarrow p < 0.01$, $^{**} \Rightarrow p < 0.05$, $^{*} \Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0.

Table A18: Impact of EBT on Perishable
Food Expenditure Cycles, Shopping Days Only

Mean Dep. Var.: 18.83 [29.49]	(1)	(2)	(3)	(4)	(5)	(6)
t	-1.46***	-0.82***	-0.79**	-1.05***	-1.33***	-1.46***
	(0.24)	(0.27)	(0.31)	(0.37)	(0.44)	(0.48)
t X EBT	0.14	-0.33	-0.24	-0.12	-0.48	-0.50
	(0.18)	(0.23)	(0.34)	(0.40)	(0.42)	(0.46)
t X # kids		-0.34***	-0.44**	-0.44**	-0.42**	-0.42**
		(0.11)	(0.17)	(0.17)	(0.18)	(0.20)
t X # kids X EBT		0.27**	0.46**	0.50**	0.46**	0.57**
		(0.13)	(0.20)	(0.20)	(0.22)	(0.23)
t X # adults - 1			0.03	0.06	-0.00	-0.03
			(0.16)	(0.15)	(0.15)	(0.16)
t X # adults - 1 X EBT			-0.28	-0.36*	-0.37*	-0.35
			(0.21)	(0.21)	(0.21)	(0.22)
t X SNAP benefit (100s '17 $)			0.12	0.14	0.14	0.15
			(0.15)	(0.14)	(0.15)	(0.15)
t X SNAP benefit X EBT			-0.23	-0.26	-0.26	-0.36*
			(0.19)	(0.18)	(0.19)	(0.21)
t X income (1000s '17 $)			0.01	0.01	0.01	0.01
			(0.01)	(0.01)	(0.01)	(0.01)
t X income X EBT			-0.01	-0.01	-0.01	-0.01
			(0.01)	(0.01)	(0.01)	(0.01)
Weekend	0.73	0.79	0.81	0.79	0.60	0.57
	(0.78)	(0.74)	(0.74)	(0.77)	(0.79)	(0.80)
Week of month	-0.82***	-0.89***	-0.87***	-0.92***	-0.65**	-0.67**
	(0.29)	(0.30)	(0.31)	(0.32)	(0.30)	(0.30)
Diary week	7.33***	7.31***	7.29***	7.35***	7.48***	7.54***
	(1.67)	(1.68)	(1.67)	(1.68)	(1.70)	(1.72)
Year FE X t	N	N	N	Y	Y	Y
State FE X t	N	N	N	N	Y	Y
State-Year Time Trend X t	N	N	N	N	N	Y
Clusters	41	41	41	41	41	41
N	5,595	5,595	5,595	5,595	5,595	5,595

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. All specifications feature household fixed effects. 1994 is the excluded year and California is the excluded state. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. One household with negative income is adjusted to $0. Perishables include fresh fruits and vegetables, non-frozen dairy items and non-frozen meat/seafood.

Table A19: Pre-EBT Consumption Trend Heterogeneity

Dep. Var.:	kCal			ln(kCal)		
	(1)	(2)	(3)	(4)	(5)	(6)
t	-31.276**	-7.538	-6.511	-0.007**	-0.001	0.000
	(12.463)	(8.107)	(10.485)	(0.004)	(0.003)	(0.004)
# kids		1657.698***	1364.840***		0.476***	0.401***
		(115.608)	(158.995)		(0.028)	(0.037)
t X # kids		-7.555	-10.731		-0.004**	-0.005**
		(6.545)	(9.705)		(0.002)	(0.002)
# adults - 1		1697.379***	1602.360***			0.444***
		(227.935)	(219.629)			(0.052)
t X # adults - 1		4.510	0.703			-0.002
		(16.206)	(14.522)			(0.003)
SNAP benefit (100s '17 $)			37.470			-0.003
			(64.160)			(0.020)
t X SNAP benefit			2.896			0.002*
			(4.219)			(0.001)
t X income (1000s '17 $)			26.420*			0.001
			(15.247)			(0.004)
t X income			-0.269			0.000
			(1.016)			(0.000)
WIC participant			100.703			-0.005
			(344.690)			(0.076)
t X WIC participant			0.508			0.008*
			(20.584)			(0.005)
# FRP breakfasts			-235.426			-0.073
			(322.569)			(0.057)
t X # FRP breakfasts			19.476			0.005
			(17.074)			(0.003)
# FRP lunches			609.210**			0.113*
			(260.794)			(0.058)
t X # FRP lunches			-10.990			-0.003
			(15.636)			(0.003)
Weekend	-197.582**	-146.028**	-147.320**	-0.038*	-0.031	-0.026
	(78.646)	(70.075)	(70.343)	(0.021)	(0.020)	(0.020)
Mean Dep. Var.	4,110.957	4,110.957	4,110.957	8.032	8.032	8.032
	[3,067.321]	[3,067.321]	[3,067.321]	[0.805]	[0.805]	[0.805]
Day-of-month FE	Y	Y	Y	Y	Y	Y
Clusters	757	757	757	757	757	757
N	1,864	1,864	1,864	1,864	1,864	1,864

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses are clustered at the household level. All specifications feature household random effects. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000. WIC participation is a household-level indicator variable, and the FRP (free or reduced-price) breakfasts and lunches variables counts the number of household members receiving those benefits.

Table A20: Impact of EBT on Goods Purchased

	Sweets Expenditures				Vegetable Expenditures			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All expenditures ('17 $)	0.042***	0.042***	0.042***	0.042***	0.057***	0.057***	0.057***	0.057***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
EBT	0.086	0.005	-0.024	-0.021	-0.014	-0.022	-0.053	-0.106
	(0.053)	(0.059)	(0.066)	(0.075)	(0.048)	(0.064)	(0.086)	(0.074)
# adults - 1	-0.054	-0.051	-0.046	-0.043	0.068**	0.067**	0.058*	0.063*
	(0.033)	(0.034)	(0.036)	(0.038)	(0.031)	(0.031)	(0.030)	(0.031)
# adults - 1 X *EBT*	0.051	0.045	0.040	0.044	-0.030	-0.026	-0.021	-0.027
	(0.050)	(0.050)	(0.051)	(0.052)	(0.040)	(0.041)	(0.042)	(0.043)
# kids	0.051**	0.046**	0.043*	0.045*	-0.015	-0.014	-0.012	-0.012
	(0.020)	(0.021)	(0.022)	(0.023)	(0.027)	(0.029)	(0.027)	(0.028)
# kids X *EBT*	-0.063**	-0.060**	-0.057**	-0.064**	0.030	0.028	0.032	0.036
	(0.025)	(0.024)	(0.024)	(0.025)	(0.030)	(0.032)	(0.030)	(0.031)
SNAP benefit (100s '17 $)	-0.005	0.002	0.003	0.000	-0.027	-0.028	-0.032	-0.031
	(0.017)	(0.018)	(0.019)	(0.020)	(0.020)	(0.021)	(0.021)	(0.021)
SNAP benefit (100s '17 $) X *EBT*	0.065	0.040	0.029	0.060	-0.144	-0.142	-0.157	-0.158
	(0.141)	(0.143)	(0.143)	(0.154)	(0.110)	(0.110)	(0.112)	(0.116)
Income (100s '17 $)	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Income (100s '17 $) X *EBT*	0.001	0.001	0.001	0.002	-0.001	-0.001	-0.001	-0.001
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Weekend	0.028	0.028	0.027	0.027	-0.021	-0.021	-0.021	-0.022
	(0.030)	(0.030)	(0.030)	(0.030)	(0.022)	(0.022)	(0.022)	(0.022)
Week of month	-0.003	-0.002	-0.003	0.000	0.010	0.010	0.009	0.007
	(0.016)	(0.016)	(0.016)	(0.016)	(0.013)	(0.013)	(0.013)	(0.013)
Diary week	0.045	0.045	0.044	0.042	0.009	0.009	0.012	0.011
	(0.033)	(0.033)	(0.033)	(0.034)	(0.028)	(0.028)	(0.027)	(0.028)
Mean Dep. Var.	0.58	0.58	0.58	0.58	0.70	0.70	0.70	0.70
	[2.59]	[2.59]	[2.59]	[2.59]	[2.68]	[2.68]	[2.68]	[2.68]
Year FE	N	Y	Y	Y	N	Y	Y	Y
State FE	N	N	Y	Y	N	N	Y	Y
State-Year Time Trend	N	N	N	Y	N	N	N	Y
Clusters	41	41	41	41	41	41	41	41
N	17665	17665	17665	17665	17665	17665	17665	17665

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses beneath the estimates are clustered at the state level. The sample is limited to the first four weeks of the benefit month, households with twelve or fewer members, and a reported SNAP disbursement of at least $10. 1994 is the excluded year. A weekend indicator, week of month trend and diary week indicator are included as day-specific controls in all specifications. SNAP benefit amount and household income, and their interactions with EBT are included as controls in all columns. Sweets consist of cookies, ice cream, and candy. Vegetables consists of fresh, frozen, canned, and and dried vegetables and legumes, as well as fresh, canned and frozen vegetable juices.

Table A21: Impact of EBT on Shopping Likelihood at the Beginning on the Benefit Month

Sample:	$t = 0$			$t < 2$		
	(1)	(2)	(3)	(4)	(5)	(6)
EBT	0.06	0.00	0.02	-0.01	-0.06	-0.07
	(0.08)	(0.09)	(0.09)	(0.04)	(0.05)	(0.05)
# kids	0.02	0.01	0.02	0.03***	0.02*	0.02*
	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.01)
# kids X EBT	0.01	0.03	0.01	-0.01	0.00	-0.00
	(0.03)	(0.04)	(0.04)	(0.02)	(0.02)	(0.02)
# adults - 1	0.03	0.00	-0.00	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
# adults - 1 X EBT	-0.04	0.02	0.03	-0.02	0.04	0.04
	(0.05)	(0.06)	(0.06)	(0.04)	(0.05)	(0.05)
SNAP benefit (100s '17 $)		0.00	0.00		0.01	0.01
		(0.02)	(0.02)		(0.02)	(0.02)
SNAP benefit X EBT		-0.00	-0.00		-0.02	-0.02
		(0.03)	(0.03)		(0.02)	(0.02)
Income (1000s '17 $)		0.00*	0.00*		-0.00	0.00
		(0.00)	(0.00)		(0.00)	(0.00)
Income X EBT		-0.01*	-0.01*		-0.00**	-0.00**
		(0.00)	(0.00)		(0.00)	(0.00)
Weekend	-0.11**	-0.11**	-0.12**	-0.02	-0.02	-0.02
	(0.05)	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)
Week of month	-0.03	-0.03	-0.02	-0.03	-0.03	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Diary week	0.15***	0.15***	0.15***	0.12***	0.12***	0.12***
	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)
Mean Dep. Var.	0.44	0.44	0.44	0.40	0.40	0.40
	[0.50]	[0.50]	[0.50]	[0.49]	[0.49]	[0.49]
Date Controls	Y	Y	Y	Y	Y	Y
SNAP, Income Controls	N	Y	Y	N	Y	Y
Year FE	N	N	Y	N	N	Y
Clusters	38	38	38	39	39	39
N	438	438	438	915	915	915

*** $\Rightarrow p < 0.01$, ** $\Rightarrow p < 0.05$, * $\Rightarrow p < 0.10$. Standard errors in parentheses beneath the estimates, are clustered at the state level. The sample is limited to the first day of the benefit month in columns (1)-(3), and the first two days of the benefit month in columns (4)-(6). It is also limited to households with twelve or fewer members, and a reported SNAP disbursement of at least $10. SNAP benefits are measured in hundreds of 2017 dollars, as a difference from $200. Household income is gross annual, and measured in thousands of 2017 dollars, as a difference from $20,000.