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Submitted Article

Changes in Low-Income Households' Spending and Time Use Patterns in Response to the 2013 Sunset of the ARRA-SNAP Benefit

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Abstract *We examine the effects of the 2013 Supplemental Nutrition Assistance Program (SNAP) benefit cut on households' food expenditures, as well as other expenditure categories by analyzing data from the 2012–2014 Consumer Expenditure Survey (CEX). Making use of the short panel structure of the CEX, we employ difference-in-differences methods with household fixed effects. Results show that reduced SNAP benefits significantly decreased the food-at-home expenditure of SNAP households, but increased expenditure on used cars and public transportation. To further explore these findings, we use the American Time Use Survey (ATUS), where we find that SNAP households spent less time on food preparation, but more time on market work (both formal work and informal work) after the 2013 SNAP benefit cut. Our findings suggest that cutting program benefits by any level is immediately reflected in low-income household's food expenditure. Our results also indicate that an increase in transportation expenditures correspond with the observed increase in labor supply for participant households. These reveal important information about the behaviors and coping strategies of low-income households as they respond to a negative shock to their income.*

Key words: American Recovery and Reinvestment Act of 2009, ARRA expiration, Household expenditure, Time use, Poverty, SNAP, Consumer Expenditure Survey, American Time Use Survey.

JEL codes: D12, I38, J22.

The Great Recession of 2007–2008 saw unemployment rise, reaching its peak at 10% in October 2009 (U.S. Bureau of Labor Statistics 2009), and median U.S. household income fall by 4.2% (U.S. Census Bureau 2009). Because of this, poverty in the United States grew rapidly in the months following, peaking at 15.1% in 2010 (Semega, Fontenot, and Kollar 2017). During this period, food insecurity—limited or uncertain access to adequate food because of a lack of money or other resources—also increased, reaching a peak of 14.9% in 2011 (Coleman-Jensen et al. 2017). The American Recovery and Reinvestment Act (ARRA) was implemented in April 2009 to address the consequences of the economic crisis, and included a boost to government assistance spending to make up for the increase in participation due to falling incomes. It has been shown that the ARRA created 1.6 to 4.6 million jobs, increased real GDP by 1.1% to 3.1%, and reduced the unemployment rate by 0.6 to 1.8 percentage points (Congressional Budget Office 2011).

Among many elements of the ARRA, maximum monthly benefits of the Supplemental Nutrition Assistance Program (SNAP) increased by 13.6% as of April 1, 2009, or about $80 per month for a family of four. Several studies have examined the effects of ARRA on food expenditure and food security of SNAP participants; most studies have found an increase in food expenditure as well as improvement in food security after the SNAP benefit increase (Nord and Prell 2011; Beatty and Tuttle 2015; Kim 2016). This new, higher SNAP benefit amount was designed to remain constant in nominal dollars, until the program's regular inflation-adjusted benefit level exceeded it.[1] However, food price inflation turned out to be lower than expected over the 2009 to 2013 period, pushing out the date that the Thrifty Food Plan (TFP) was expected to exceed the ARRA level. Accordingly, Congress passed a law to accelerate the sunset of the ARRA to a date earlier than scheduled. As a result, on November 1, 2013, SNAP benefit levels were based on the cost of the June 2013 TFP, $632—a $36 decrease from the maximum monthly benefit for a family of four under ARRA (Dean and Rosenbaum 2013). To our knowledge, few studies have considered how the ARRA sunset has affected SNAP participants. Given the positive effects of ARRA benefit increases on food expenditure, we can hypothesize that a cut in benefits will likely affect households' expenditure in the opposite direction.

This paper uses the Consumer Expenditure Survey (CEX) from 2012 until 2014 to estimate the effects of the ARRA-SNAP sunset on the top five expenditure categories of households: food, housing, transportation, health care, and other expenditure. In addition, we investigate changes in time use during the ARRA-SNAP sunset using American Time Use Survey (ATUS) data from 2012 to 2014. These results provide insights into the changes in economic behavior of low-income households when facing a cut in disposable income, allowing policy makers to better understand how the general well-being of low-income households is impacted by changes in federal assistance programs. Specifically, our CEX and ATUS analyses provide insights into how low-income households adjust their expenditure and labor-leisure trade-off choices, respectively, in response to a negative income shock.

[1]*The maximum SNAP benefit levels are set each October 1 by the cost of the Thrifty Food Plan (TFP) from the preceding June, scaled to each household size. The TFP is the cheapest food plan specifying foods to purchase and prepare a bare-bones diet at home, and is calculated monthly using the Consumer Price Index (CPI).*

Previous Literature

Recent research on the implementation of ARRA, as well as the ARRA sunset, have come to similar conclusions. The benefit boost after ARRA increased food expenditure and households' other expenditure; it seemed to have protected households from experiencing food insecurity by increasing food budgets. Meanwhile, the ARRA sunset caused a decrease in food-at-home expenditure and a rise in food insecurity for participant households. One mechanism by which this may have occurred is due to a decline in participation, as participation in SNAP is associated with lower rates of food insecurity (Gundersen, Kreider, and Pepper 2017). Another mechanism is that lower SNAP benefits are associated with higher rates of food insecurity, all else being equal (Gundersen, Kreider, and Pepper 2018).

Nord and Prell (2011) used the Current Population Survey Food Security Supplement (CPS-FSS) to measure the effects of ARRA on food spending and food security in 2008 and 2009, before and after the ARRA implementation. These authors found that food security in low-income households fell by 2.2 percentage points from 2008 to 2009, while very low food security fell by 2 percentage points. In addition, Nord and Prell also found that food spending increased for SNAP participants more than low-income non-participants during this period, suggesting the increase in benefits may have encouraged higher food spending for participating households.

Using the Consumer Expenditure Survey (CEX), Beatty and Tuttle (2015) found that the boost in benefits because of ARRA caused households to increase their food-at-home share of total expenditure by more than economic theory would predict. Neoclassical theory asserts that households will spend SNAP benefits no differently than equivalent cash benefits. This means that an increase in benefits should cause the identical behavioral response as an increase in cash income in participating households. However, Beatty and Tuttle found that the food expenditure share increased by more than what would have increased in response to cash income receipt. As a robustness check, these authors show that the share of food-away-from-home did not increase, which supports that the increase in food spending share is indeed due to the SNAP benefit boost.

Kim (2016) also used the CEX and found that the ARRA-induced SNAP benefit jump increased not only food spending, but also spending on housing, transportation, and education for SNAP participants. This implies the income effect of the increase in the household budget was felt in many household expenditure items.

Few papers have examined the effects of the ARRA sunset. Katare and Kim (2017) used the CPS-FSS for the years 2012–2014 to estimate the effects of the sunset on food security and food-at-home spending for SNAP participants. These authors found that food-at-home spending decreased significantly after the ARRA sunset. In December 2013, the ratio of food-at-home spending relative to the Thrifty Food Plan declined by 5.5% compared to December 2012. In December 2014, the ratio declined by 4% compared to December 2012, indicating that the cut in food spending was larger immediately after the drop in monthly benefits.

This paper builds on these previous studies to determine if the ARRA sunset affected food expenditure as well as other household expenditures. Unlike previous studies, this paper examines the effect of the ARRA sunset on the top five household expenditure categories, which allows us to better

Table 1 Expenditure Outcomes in Consumer Expenditure Survey (CEX)

Item	Description
Total Expenditure	The sum of all household expenditure the consumer unit reports in the survey.
Food Expenditure	Food-at-home, food-away-from-home, alcoholic beverages.
Housing Expenditure	Shelter, utility, household operation, household equipment.
Transportation Expenditure	New/used cars, gas, vehicle finance charges, insurance, rental, licenses, public transportation.
Health Expenditure	Health insurance, medical services, prescription drugs, medical supplies.
Other Expenditure	Entertainment, apparel, education, personal care, tobacco.

assess the total impact of the sunset on the well-being of low-income households participating in SNAP. Most importantly, we contribute to the literature by studying how the ARRA sunset has influenced the time use of SNAP participants, particularly their food preparation and labor supply behavior, to supplement the observed changes in spending patterns. To the best of our knowledge, this is the first research paper to quantify the effects of ARRA-SNAP benefit cut on the time use of participants.

Data: Consumer Expenditure Survey

For our main analysis, we use the Consumer Expenditure Quarterly Interview Survey for the years 2012 through 2014 to capture expenditure information of participant households before and after the ARRA sunset. The Consumer Expenditure Quarterly Interview Survey follows the same consumer units every three months, providing a short panel of up to five consecutive quarters. The survey includes information on not only expenditures for each spending category (listed in table 1), but also household income, employment, and welfare program participation such as the total amount of SNAP benefits the household received over the past 12 months.

We restrict our analysis sample to households whose quarterly interviews were implemented both before and after November 2013, the sunset of the ARRA-SNAP benefit increase. This allows us to estimate models with a household fixed effect—measuring the changes in spending patterns within the same households before and after the policy change. Also, we restrict the sample to include households with annual incomes below 130% of the federal poverty line (FPL) to focus on households for whom the effects of the SNAP benefit cut would have been most severely felt.

Empirical Methods

Estimating the effects of changes in SNAP benefits is a challenge because households self-select into the program. In other words, a household's decision to participate in the program may be determined by unobservable characteristics or factors related to the household. Likewise, how much a household spends on food or other goods in each period of time may also be determined by unobservable characteristics. If these characteristics are

the same, bias is introduced into the estimation process and the results may misrepresent the real effect of the ARRA sunset on expenditure.

To address these potential sources of bias, we use a difference-in-differences and household fixed effect approach. The difference-in-differences model allows us to compare the changes in household expenditures of the treatment group, or SNAP participants, to the changes in expenditures of the control group, or eligible nonparticipants. Accounting for the possibility that SNAP participation status could change in response to the policy change, we restrict our sample to households whose SNAP participation status remained constant over the time frame. The underlying assumption of this approach is that, absent the ARRA sunset, participant and nonparticipant households would exhibit the same trend in household expenditures.

Prior to implementing the difference-in-differences approach, we must construct a treatment and control group that we assume will experience similar trends absent the policy. Because it is likely that SNAP participants differ from nonparticipants in unobservable ways, striving for balance between the groups, or ensuring the observable characteristics are similar, will help us avoid further bias. To do this, we use the Coarsened Exact Matching process (CEM; Blackwell et al. 2009). This is a matching method that allows us to match treatment and control groups based on the observable characteristics of each group, such as race of head, marital status of head, employment status of head, household income, family size, and age of head. However, the matching needs not be exact. Participant and nonparticipant households need only fall within the same category (e.g., annual income between $13,500 and $15,500) in each demographic variable to be matched.

Our model includes household fixed effects to further control for unobservable characteristics of the households that are fixed over time. Specifically, we estimate

$$Y_{ht} = \beta_0 + \beta_1 After_t + \beta_2 SNAP_{ht} * After_t + \rho_h + \eta_t + e_{ht} \quad (1)$$

where Y_{ht} represents log of household expenditure before and after the ARRA sunset. $After_t$ is a dummy that takes on the value of zero before the ARRA sunset and one after, and $SNAP_{ht}$ is a participation dummy that takes on the value of one if the household participates in SNAP. Finally, ρ_h represents household fixed effects and η_t is month fixed effects. As mentioned earlier, we limit our sample to households who were interviewed *both* before *and* after November 2013 in our analysis. For example, if a household was interviewed in June 2013, September 2013, December 2013, and March 2014, its quarterly expenditure reported in June 2013 and September 2013 interviews are included in *before*, and quarterly expenditure reported in March 2014 interviews are included in *after*. December 2013 interview reports expenditure for September, October, and November 2013, which has both before and after components, thus we drop December 2013 interview from the analysis.

It is worth noting that SNAP receipt can be substantially underreported in the CEX. Using the first quarterly interviews of the CEX that report non-imputed program participation, we calculated SNAP participation rates in the CEX. Table 2 shows the proportion of households in the CEX that reported SNAP receipt in comparison to the administrative participation

Table 2 Supplemental Nutrition Assistance Program Participation Rate

Year	CEX (%)	USDA Administrative Data (%)	Difference (%p)
2010	11.96	13.03	−1.07
2011	12.47	14.35	−1.88
2012	11.32	14.84	−3.52
2013	10.58	15.06	−4.48
2014	11.07	14.65	−3.58

Note: *SNAP participation rates in the Consumer Expenditure Survey (CEX) are calculated by the authors using all consumer units from the first quarter interviews of the CEX 2010–2014. Administrative SNAP participation rates are calculated using program data from "Supplemental Nutrition Assistance Program Participation and Costs, 1969–2017", from the Food and Nutrition Service, USDA (https://fns-prod.azureedge.net/sites/default/files/pd/SNAPsummary.pdf). Total U.S. population is derived from Federal Reserve Economic Data (FRED), (https://fred.stlouisfed.org/series/POPTOTUSA647NWDB).*

rates released by the USDA.[2] SNAP participation rates reported in the CEX are 1 to 4 percentage points lower than those from administrative SNAP data. This means it is likely that our control group includes some SNAP households. Consequently, the differences between the treatment and control group will be smaller than the true difference and our results may underestimate the true effects of the benefit cut.

Lastly, it is essential to check whether there were any other policy changes around the time of the ARRA sunset. One caveat associated with this analysis is that Medicaid eligibility was expanded in 25 states and the District of Columbia on January 1, 2014, which was only two months after the ARRA sunset.[3] This meant the income eligibility threshold of Medicaid coverage was expanded from the previous 106% of the FPL to 138% of the FPL. Research has suggested that expansion states saw larger reductions in out of pocket medical spending than non-expansion states (Hu et al. 2016; Mulcahy, Eibner, and Finegold 2016) and there was a small but positive effect on employment as well as the labor market after the eligibility expansion (Hall et al. 2017; Kaestner et al. 2017). Since a high proportion of SNAP participants were already receiving SNAP prior to the Medicaid expansion, we put less weight on this as a potential issue for our analysis.

There were no major changes in other assistance programs, such as Temporary Assistance for Needy Families (TANF), Medicare, Earned Income Tax Credit (EITC), or Social Security (SS) during this period.

Descriptive Statistics

Table 3 provides descriptive statistics for SNAP households with income under 130% of the FPL before and after the sunset, and for non-SNAP households with income under 130% before and after the sunset. Mean food

[2] *It would be best if we could give a metric of the extent of underreporting in the low-income sample we are using. However, USDA provides SNAP participation rates using the full population only. Therefore, there is no administrative measure that is directly comparable with measures from the CEX. Accordingly, we calculated the SNAP participation rates using all consumer units in the CEX to ensure comparability with the official measure.*

[3] *25 states and Washington DC were moving toward Medicaid expansion as of November, 2013. Officially, the Medicaid expansion went into effect on January 1, 2014 in these states. Expansion of Medicaid eligibility was made optional at the state level.*

expenditure as well as share of total expenditure on food declined for SNAP households, mainly driven by a decline in food-at-home spending. The share of the SNAP sample that was employed substantially increased by almost 16% (from 41% to 48%) after SNAP benefits were cut. Not only the extensive margin, but also the intensive margin of labor supply shows a significant increase: there was a 14% increase in hours worked per week (from 14 hours to 16 hours) and a 16% increase in weeks worked per year (from 16 weeks to 19 weeks) for SNAP households following the ARRA sunset. Meanwhile, we do not see any changes in either extensive or intensive employment rates for eligible non-participants. An increase of $140 (from $5,725 to $5,864) in earned income for SNAP households aligns with the increase in employment trend, while there is a drop in earned income for eligible non-participants. As expected, the total annual SNAP benefit amount fell after the ARRA sunset. Yearly before-tax salary seems to be lower for eligible non-participants, but it becomes similar once annual SNAP benefit amounts are subtracted from yearly before-tax salary for SNAP participants. This again assures that these two groups are similar in their income/poverty status, but one group receives SNAP while the other does not. Due to the CEM process, observable demographic characteristics between SNAP and non-SNAP households are similar overall.

Because of the changing policy and participants' responses to the policy, it is possible that the composition of SNAP participants changed before and after the ARRA sunset. To address whether the differences between SNAP participants' characteristics pre- and post-ARRA sunset are statistically significant, we performed a balance test and calculated t-statistics for each variable in table 3. None of the demographic characteristics of SNAP participants differed at a statistically significant level before or after the sunset (results not shown). This shows the composition of SNAP participants before and after the sunset remained the same.

Results –Consumer Expenditure Survey

For our empirical analysis, we compare SNAP households to eligible non-participating households using a difference-in-differences model that includes household fixed effects.

Table 4 contains the results comparing SNAP households to non-SNAP households with income below 130% of the FPL.[4] The difference-in-differences coefficient is negative and significant for food expenditure, suggesting that SNAP households decreased food expenditure after the sunset by 12% more than non-SNAP households. The difference-in-differences coefficient is positive and significant when estimating the effects on transportation expenditure, suggesting that SNAP households spent 24% more on transportation after the decrease in benefits than similar non-SNAP households. This higher expenditure on transportation appears to be related to an increase in labor supply among low-income households.[5] As evidenced in

[4]*We expanded our analysis sample to include households with income below 185 percent and 250 percent of the FPL as a robustness check. The results are substantially similar, although some of the interaction coefficients lose statistical significance as the effect of SNAP benefit cut is assumed to be most evident among very low-income households. Therefore, we only show the results for households whose income is below 130 percent of FPL.*

[5]*Medicaid expansion may be a contributing factor to the increase in employment, but we do not formally assess it in this study.*

Table 3 Descriptive Statistics for SNAP and non-SNAP Participants before and after ARRA Sunset

	SNAP & <130% FPL		Non-SNAP& <130% FPL	
Variables	**Before**	**After ARRA Sunset**	**Before**	**After ARRA Sunset**
Outcome Variables (Quarterly Expenditure, $2013)				
Total Expenditure ($)	4,745.59	5,093.20	6,526.37	6,242.60
	(3,296.63)	(3,489.12)	(5,364.46)	(4,923.53)
Food ($)	1,150.33	1,114.71	1,252.81	1,213.83
	(805.77)	(756.24)	(973.85)	(840.17)
Food at Home ($)	1,028.08	974.89	941.85	925.21
	(721.73)	(662.14)	(724.83)	(631.29)
Food away ($)	122.25	139.82	310.96	288.61
	(272.80)	(233.32)	(433.49)	(430.39)
Food (share, %)	26.52	24.79	21.97	22.06
	(14.35)	(13.19)	(12.12)	(11.52)
House ($)	1,937.19	2,011.06	2,436.29	2,385.38
	(1,271.35)	(1,306.47)	(1,823.51)	(1,782.86)
House (share, %)	42.35	42.29	41.45	41.81
	(16.79)	(17.08)	(17.75)	(17.07)
Transportation ($)	685.09	920.71	1,229.27	950.55
	(1,411.36)	(2,387.44)	(3,055.49)	(2,627.65)
Transportation (share, %)	11.52	12.01	13.64	12.01
	(12.32)	(14.12)	(13.93)	(12.53)
Health ($)	217.71	321.12	507.90	565.18
	(442.89)	(757.30)	(1,299.55)	(1,144.96)
Health (share, %)	4.80	5.92	7.32	8.61
	(8.68)	(10.47)	(11.04)	(11.10)
Others ($)	735.05	710.91	1,055.35	1,089.70
	(1,441.87)	(630.64)	(1,560.46)	(1,845.24)
Others (share, %)	14.34	14.60	14.92	14.90
	(10.42)	(9.94)	(11.95)	(11.86)
Household Head Characteristics				
Female Head (%)	73.04	72.07	61.61	63.25
	(44.44)	(44.93)	(48.67)	(48.25)
Married Head (%)	15.65	18.62	27.76	28.06
	(36.39)	(38.98)	(44.81)	(44.96)
Race: White (%)	73.04	74.77	81.73	81.34
	(44.43)	(43.50)	(38.67)	(38.99)
Race: Black (%)	23.48	21.62	15.72	16.52
	(42.45)	(41.23)	(36.43)	(37.17)
Race: Others (%)	3.48	3.60	2.55	2.14
	(18.35)	(18.67)	(15.77)	(14.47)
Household Characteristics				
Employed (%)	41.16	47.75	48.16	48.86
(Head+Spouse combined)	(49.28)	(50.02)	(50.00)	(50.02)
Hours worked per week	14.28	16.39	19.10	19.31
(Head+Spouse combined)	(9.94)	(20.34)	(23.73)	(23.87)
Weeks worked per year	16.50	19.15	21.17	22.17
(Head+Spouse combined)	(22.87)	(24.30)	(27.38)	(26.60)
Yearly Before-Tax Salary ($)	13,807.96	13,636.83	10,214.46	11,810.53
	(8,672.88)	(8,579.63)	(24,646.63)	(9,270.80)

Continued

Table 3 *Continued*

	SNAP & <130% FPL		Non-SNAP& <130% FPL	
Variables	**Before**	**After ARRA Sunset**	**Before**	**After ARRA Sunset**
(Earned income, Gvt transfer, social security, pension, etc.)				
Earned Income ($)	5,725.22	5,864.67	6,404.12	6,199.29
	(8,451.56)	(8,735.78)	(10,175.49)	(9,818.50)
Annual SNAP benefit ($)	2,941.70	2,778.54	0	0
	(2,333.30)	(2,174.64)		
No. of Children	0.98	0.95	0.52	0.58
	(1.34)	(1.34)	(1.13)	(1.24)
Family Size	2.64	2.58	2.09	2.09
	(1.62)	(1.65)	(1.54)	(1.60)
Most Highly Educated Adult				
Less than High School (%)	35.07	34.83	22.52	21.37
	(47.79)	(47.72)	(41.80)	(41.02)
High School Graduate (%)	28.11	26.12	24.50	30.34
	(45.02)	(43.99)	(45.86)	(46.00)
Some College (%)	22.61	21.62	25.35	22.79
	(41.89)	(41.29)	(43.53)	(41.98)
Bachelor's and above (%)	14.20	17.42	27.62	25.49
	(34.96)	(37.98)	(44.74)	(43.61)
Number of Households-quarters	345	333	706	702

Note*: Analysis sample includes the households with annual income less than 130% of the federal poverty line (FPL). The SNAP group indicates households that received SNAP at any time during the previous year. Standard deviations appear in parentheses. All analyses use household supplement weights.*
Source*: Consumer Expenditure Survey 2012 through 2014.*

Table 4 SNAP vs. No SNAP and FPL < 130%

Outcomes	**log(food)**	**log(housing)**	**log(trans)**	**log(health)**	**log(others)**
After	0.0536	0.0199	−0.1412	0.3603*	−0.0979
	[0.093]	[0.058]	[0.141]	[0.204]	[0.114]
After * SNAP	−0.1258*	0.0697	0.2373*	0.2010	0.0155
	[0.076]	[0.085]	[0.128]	[0.203]	[0.110]
Constant	6.7893***	7.4167***	5.4796***	3.3633***	6.2007***
	[0.043]	[0.030]	[0.080]	[0.111]	[0.070]
Observations	2,086	2,086	2,086	2,086	2,086
R-squared	0.011	0.013	0.009	0.027	0.006
Number of HH	851	851	851	851	851

Note*: Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, *= $p < 0.1$. Analysis sample includes households with an annual income less than 130% of the federal poverty line. Month fixed effect and household fixed effect are included.*
Source*: Consumer Expenditure Survey 2012 through 2014.*

table 3, SNAP households increased their labor supply, both at extensive and intensive margins, and car ownership is a critical factor in SNAP households' ability to commute, especially if they have multiple jobs, temporary/seasonal jobs, or jobs with unusual hours.

Table 5 SNAP vs. No SNAP and FPL < 130% ABAWDs Households

Outcomes	log(food)	log(housing)	log(trans)	log(health)	log(others)
After	0.0867	−0.0562	0.0792	0.6644**	−0.0794
	[0.060]	[0.077]	[0.141]	[0.269]	[0.111]
After * SNAP	−0.4535**	0.4734	0.1726	−0.5005	0.1832
	[0.212]	[0.367]	[0.371]	[0.424]	[0.236]
Constant	6.6746***	7.3323***	5.5050***	2.4651***	6.2798***
	[0.030]	[0.043]	[0.064]	[0.113]	[0.048]
Observations	618	618	618	618	618
R-squared	0.029	0.021	0.003	0.029	0.003
Number of HH	285	285	285	285	285

Note: *Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.1$. Analysis sample includes households with an annual income less than 130% of the federal poverty line. Month fixed effect and household fixed effect are included.*
Source: *Consumer Expenditure Survey 2012 through 2014.*

Consistent with this finding, a report from the Pew Charitable Trusts (2016) using the same data from the CEX shows that the lowest income households spent a much higher share on transportation than other households and showed there was almost a 50% (10.7% to 15.7%) increase in the transportation expenditure share from 2013 to 2014. However, they do not investigate which specific purchases were driving this change. This suggests that our findings align with the underlying trend that took place during this period.

In tables 5 and 6, we perform a subgroup analysis by "able-bodied adults without dependents (ABAWD)" status. ABAWDs can only receive SNAP for three months in three years if they do not meet certain special work requirements. Table 5 shows that the decline in food expenditure shown in table 4 is driven by ABAWDs, while the increase in transportation spending is driven by households with dependents.

We replicate Beatty and Tuttle (2015) as a robustness check in table 7 by looking at the *share* of expenditure as our main outcome and additionally controlling for the natural log of total household expenditure in the regression. By doing so, we estimate the effect of the benefit level change on the food share of total expenditure, above and beyond the effect of changes in household resources. We find that participating households reduced the share of total expenditure allocated toward food by nearly 1.74% after the SNAP benefit cut, above and beyond the effect of decreased total household expenditures on food, again strongly driven by food-at-home spending. Our finding is 2.5 times larger than the estimate from Beatty and Tuttle (0.723), mainly because we are concentrating our analysis on very low-income households, while Beatty and Tuttle include all households regardless of income level, which could induce the overall effect to be muted. Furthermore, Beatty and Tuttle do not examine the 2009 ARRA SNAP benefit increase alone, but all the benefit changes that took place between 2007 and 2010. Similarly, SNAP participating households increase the share of total expenditure allocated toward transportation by 1.8% after the SNAP cut, above and beyond the effect of household resource changes on transportation expenditure.

Table 6 SNAP vs. No SNAP and FPL < 130% Households with Dependents (Child under 18 years old or Elderly)

Outcomes	log(food)	log(housing)	log(trans)	log(health)	log(others)
After	−0.0436	0.0921	−0.1860*	0.2824**	0.0297
	[0.050]	[0.079]	[0.097]	[0.123]	[0.111]
After * SNAP	−0.0510	−0.0256	0.2813*	0.3407	−0.0846
	[0.097]	[0.111]	[0.153]	[0.240]	[0.156]
Constant	6.9342***	7.4818***	5.5534***	3.7559***	6.0749***
	[0.022]	[0.029]	[0.037]	[0.053]	[0.040]
Observations	1,215	1,215	1,215	1,215	1,215
R-squared	0.003	0.006	0.006	0.028	0.000
Number of HH	497	497	497	497	497

Note: *Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.1$. Analysis sample includes households with an annual income less than 130% of the federal poverty line. Month fixed effect and household fixed effect are included.*
Source: *Consumer Expenditure Survey 2012 through 2014.*

Table 7 SNAP vs. No SNAP and FPL < 130% Outcome: Share of Total Expenditure

Outcomes	Food	Food at home	Housing	Transportation	Health	Others
After	0.6648	0.6570	0.9052	−2.4489**	2.0050**	−1.1262
	[0.994]	[0.979]	[1.315]	[1.132]	[0.899]	[0.873]
After * SNAP	−1.7402*	−1.9281**	0.2929	1.8513*	−0.2753	−0.1287
	[0.936]	[0.883]	[1.404]	[1.014]	[0.734]	[0.958]
ln(TotExp)	−8.3562***	−7.0458***	−6.6957***	12.5103***	1.2317	1.3099
	[1.031]	[1.019]	[2.192]	[2.076]	[1.169]	[1.472]
Constant	94.2453***	78.8233***	96.8771***	−92.4570***	−4.0359	5.3705
	[8.803]	[8.714]	[18.589]	[17.623]	[10.008]	[12.417]
Observations	2,086	2,086	2,086	2,086	2,086	2,086
R-squared	0.109	0.095	0.044	0.171	0.018	0.015
Number of HH	851	851	851	851	851	851

Note: *Replication of* Beatty and Tuttle (2015). *Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.1$. Outcomes are the share of total expenditure. Food at home is a subcategory of food. Analysis sample includes households with an annual income less than 130% of the federal poverty line. Month fixed effect and household fixed effect are included.*
Source: *Consumer Expenditure Survey 2012 through 2014.*

To further explore these results, we consider subcategories of food and transportation expenditure. First, we run the difference-in-differences model using food-at-home (FAH) and food-away-from-home (FAFH) separately in table 8. The results indicate the estimated reduction in food expenditure is strongly driven by a reduction in FAH expenditure, which is consistent with the hypothesis of increased labor supply following the decrease in SNAP benefits. Because SNAP benefits cannot be used for FAFH, this analysis provides further evidence that the decrease in food expenditure was triggered by a decrease in SNAP benefits.

We also examine transportation expenditure subcategories in table 8. The results indicate that the increase in the transportation expenditure is

strongly driven by increased expenditure on used cars. Given that labor supply increased both at the extensive and intensive margins during this period for the SNAP group, these households appear to spend their money more on used cars, as car ownership is critical to their ability to work and commute. Considering that a third of the sample includes ABAWDs who are required to work in order to be waived from a time limit on benefits, it makes sense that the increase in used car purchases is not statistically significant for households with children, who are not subject to work requirements. For households with children, the increase is driven by public transportation expenditure.

Lastly, we also performed placebo tests by running the same specifications with different years, using households whose sequence of quarterly interviews were completed before the ARRA-SNAP benefit cut (2012–2013) or started after the ARRA-SNAP benefit cut (2014–2015). The placebo tests (results not shown) reaffirm that a differential effect on food and transportation expenditures occur only among households that are interviewed immediately before and after the ARRA-SNAP benefit decrease.

Data: American Time Use Survey

Next, we consider whether the results from our CEX analysis are supported by time use data. Our findings based on CEX data indicate that SNAP households exhibit lower levels of food expenditure and higher levels of transportation expenditure, relative to their eligible non-participating counterparts, following the ARRA-SNAP sunset. In this section we examine whether these findings are reflected in how households spend their time. What the CEX results cannot fully reveal could be further answered by examining how households allocate their time before and after the ARRA-SNAP sunset.

The American Time Use Survey (ATUS) is a subset of the Current Population Survey (CPS). After households complete their final month of the CPS, they are eligible to participate in the ATUS. If chosen, respondent households are interviewed again two to five months after their final CPS interview. The interview includes a diary of how they spend their time on one day. The information collected includes time spent in household management, work, sleeping, exercise, childcare, leisure, as well as other activities.

For our time-use analysis, we consider the following activities: time spent in food preparation (which consists of travel time related to food preparation, cooking time, and grocery shopping time), time spent for food away from home, travel time related to work, child care, and time spent for formal work and informal work. However, ATUS does not provide information on SNAP receipt. Rather than relying on household income or other demographic variables as a proxy for SNAP receipt, we merge the ATUS with the CPS to obtain SNAP receipt information, despite a small loss in sample size. Specifically, we merge the ATUS with the CPS Food Security Supplement (FSS) and CPS Annual Social and Economic Supplement (ASEC). Our ATUS analysis is slightly different from the previous CEX analysis because households are interviewed once, thus models with household fixed effects cannot be employed. Therefore, we compare households interviewed before November 2013 with those interviewed after November 2013 and run a standard difference-in-differences model.

Table 8 Expenditure Subcategory Analysis

Outcomes	log(Food at home)		log(Food away)		log(Used car purchase)		log(public transportation)	
	All	With child	All	With child	All	With child	All	With child
After	0.0902	0.1436	0.1048	0.535	−0.1059	−0.1284	0.1007	−0.1429
	[0.107]	[0.237]	[0.205]	[0.4087]	[0.161]	[0.440]	[0.156]	[0.286]
After * SNAP	−0.1727*	−0.1252	0.1960	0.5059	0.3250*	0.4935	0.1232	0.5159*
	[0.103]	[0.132]	[0.207]	[0.373]	[0.174]	[0.443]	[0.144]	[0.267]
Constant	6.4992***	6.9433***	3.4380***	3.4992***	0.2597***	0.4848*	0.8491***	0.8021***
	[0.056]	[0.103]	[0.123]	[0.231]	[0.095]	[0.261]	[0.092]	[0.159]
Observations	2,086	654	2,086	654	2,086	654	2,086	654
R-squared	0.015	0.033	0.016	0.055	0.013	0.031	0.009	0.032
Number of HH	851	275	851	275	851	275	851	275

Note*: Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.1$. Food-at-home and Food-away are subcategories of food. Used car purchase and Public transportation are subcategories of transportation. Analysis sample includes households with an annual income less than 130% of the federal poverty line. Month fixed effect and household fixed effect are included.*

Source*: Consumer Expenditure Survey 2012 through 2014.*

We include state, day and month fixed effects, and a vector of demographic characteristics of households:

$$Y_{ht} = \beta_0 + \beta_1 SNAP_{ht} + \beta_2 After_t + \beta_3 SNAP_{ht} * After_t + X'\alpha + \rho_s + \delta_t + \gamma_t + \epsilon_{ht} \quad (2)$$

. The outcome variable, Y_{ht}, represents minutes spent in each of the activities of interest listed above. $After_t$ takes on the value of one after the ARRA sunset, and $SNAP_{ht}$ takes on the value of one if the households report they received SNAP at any time during the previous year.[6] To be consistent with our CEX analysis, we use Coarsened Exact Matching (CEM) to strive for balance in observable characteristics between SNAP and non-SNAP group.

Results–American Time Use Survey

Table 9 provides the results from the American Time Use Survey. Following the benefit cut, SNAP participating households spent 14 minutes less on food preparation per day than similar non-participating households. When we break this down further by specific categories of time use, the decrease is mainly due to reductions grocery shopping time and travel time related to food preparation, not due to cooking time. These households do not offset the reduced time for food at home with increased time on food away from home: time spent on food away from home fell as well after SNAP cut. Katare and Kim (2017) provided strong evidence that SNAP households' food spending dropped immediately after the benefit cut. This means a reduction in SNAP benefits is associated with lower spending on food, consequently less time allocated to meal preparation.

As shown in the CEX analysis, the employment rate of SNAP households significantly increased after the SNAP benefit cut. Consistent with this, the ATUS analysis shows that time spent on market work increased by 30 minutes per day for SNAP households following the benefit cut, driven by increases in time spent on both formal (working) and informal work (domestic work). Non-work time decreased accordingly. The advantage of using the ATUS is that we can distinguish between the types of income-generating activities. Domestic work category includes informal work done for pay, such as babysitting, housekeeping, mowing lawns, and making food, crafts, used items for sale, etc. SNAP households appear to increase labor supply after the benefit cut, in part by participating in this kind of informal work. Findings from the ATUS, combined with our CEX analysis, suggest that SNAP households responded to the benefit cut, a negative income shock, by reducing both their economic and time resources allocated to food and increasing their labor supply.

Discussion/Policy Implications

Previous research on policy changes that affect low-income households indicates that well-being effects are better measured by examining changes

[6]*We also used households who participated in SNAP for all 12 months during the previous year as a measure of SNAP receipt. The results are substantially similar – that is, statistically significant with slightly higher magnitude of the estimates due to its nature as a high-intensity measure of SNAP receipt.*

Table 9 American Time Use Survey Analysis

Outcomes (minutes/day)	Food prep	Travel related to food prep	Cooking	Grocery shopping	Food away	Market Work	Working	Domestic Work	Non-Work
Any SNAP	8.065***	2.681***	5.824***	−0.440	1.920***	−9.668	−9.375	−0.349	21.792***
	[2.695]	[0.893]	[2.156]	[0.713]	[0.723]	[7.533]	[7.479]	[0.947]	[7.879]
After	−0.104	1.108	−7.022*	5.809***	0.309	−28.908	−24.514	−1.763	−4.770
	[4.768]	[1.896]	[3.633]	[1.936]	[1.995]	[19.409]	[19.314]	[1.174]	[22.941]
SNAP*After	−13.892***	−6.568***	−0.355	−6.969***	−4.600***	30.309**	23.734*	5.854*	−27.621*
	[4.127]	[1.172]	[3.282]	[1.235]	[0.836]	[12.420]	[12.217]	[3.222]	[15.509]
Constant	−25.597**	−3.392	−10.911	−11.294***	4.045**	103.308***	87.206***	−0.092	1,285.445***
	[10.661]	[2.186]	[9.386]	[3.311]	[1.734]	[29.540]	[30.362]	[3.267]	[33.684]
Observations	8,408	8,408	8,408	8,408	8,408	8,408	8,408	8,408	8,408
R-squared	0.159	0.054	0.162	0.067	0.058	0.484	0.488	0.137	0.428

Note: *Robust standard errors appear in brackets. Asterisks indicate the following: ***= $p < 0.01$, **= $p < 0.05$, and *= $p < 0.1$. Travel related to food prep, cooking, and grocery shopping are subcategories of food preparation. Working and domestic work are subcategories of market work. Education, age, age-squared, sex, race, labor force participation, family size, metropolitan, holiday indicator, day fixed effects, month fixed effects and state fixed effect are included. ATUS final weight is used.*

Source: *American Time Use Survey 2013 through 2014 merged with Current Population Survey Food Security Supplement and Current Population Survey Annual Social and Economic Supplement.*

in household consumption as opposed to changes in household income (Meyer and Sullivan 2008). Consequently, using the CEX to estimate how changes in SNAP benefits affect household consumption levels may provide policy makers with better insights into how proposed policy changes affect the well-being of SNAP recipients.

Our results are supported by Johnson, Parker, and Souleles (2006), who showed that changes in household transfers are immediately revealed through changes in household consumption. This is because low-income households tend to have little savings and consume most of their income within the same period of time of receiving it.

Previous studies found a disproportionate increase in food spending after the ARRA-SNAP benefit increase; a change in transfers was reflected through a change in food spending. Moreover, Kim (2016) found an increase in other household expenditures, where households could increase expenditures in essential spending categories following the benefit boost. The increase in income after ARRA was immediately transferred to household spending in numerous categories, illustrating that low-income households prioritize household spending over saving.

The results of this study demonstrate that households also respond immediately to a decrease in transfers. Our results indicate reducing SNAP benefits cause households to decrease their food spending; notably, food-at-home spending, which is directly related to the SNAP benefit level. This suggests that many participant households did not have the income to smooth their food expenditure through reallocating income from other sources toward food.

However, the results indicate no negative spillover effects and, in fact, we find an increase in transportation expenditures. This may be because the decline in benefits was smaller than the increase in benefits in 2009. It may be that it was small enough that other household expenditures were unaffected.

Our findings shed light on potential policies recently discussed to cut federal funding for SNAP. Specifically, our findings suggest that cutting program benefits by any level will be immediately reflected in low-income household's food expenditure. If reductions to SNAP benefits cause households to significantly cut their food spending, this may have implications on the food security of these households and the concomitant consequences associated with food insecurity.

Our results also indicate an increase in transportation expenditures after the ARRA sunset, which is mainly driven by used car purchases (for ABAWDs) and public transportation (for households with children). The increase in transportation expenditures may correspond with the observed increase in labor supply for participant households following the reduction in SNAP benefits. There are a limited number of studies on the impact of SNAP on labor supply, but most find disincentives to work in response to SNAP participation (Hagstrom 1996; Hoynes and Schanzenbach 2012; East 2016). However, these studies did not consider the labor supply of participants under reductions to program benefits. As a result, it is plausible that a decline in SNAP benefits may result in higher employment or increased hours of work.

Conclusion

In this study, we analyzed the effect of the 2013 SNAP benefit cut because of the ARRA sunset on participants' food and non-food expenditure as well

as time use patterns. Using a difference-in-differences model that accounts for household fixed effects, we found that expenditure on food decreased more for SNAP households than eligible non-SNAP groups after the benefit cut. Meanwhile, expenditure on transportation increased over the same period, plausibly induced by a strong increase in labor market opportunities for the low-income population.

The American Time Use Survey analyses strengthen the findings from our analysis using the Consumer Expenditure Quarterly Interview Survey. As food expenditure decreased, driven by a decrease in food-at-home expenditure, SNAP households spent less time on travel related to food preparation and grocery shopping. In addition, SNAP households increased their transportation expenditure, caused by used car purchases for ABAWDs and public transportation for households with children, which may be consistent with increased labor supply among SNAP households. This hypothesis is further supported by our time-use findings, which indicate that SNAP households increased their time spent on market work—both formal and informal—after the benefit cut.

By examining the top five categories of household expenditures—food, housing, transportation, health, and other goods—as well as time use of SNAP households, important insights are gained into the effect of the SNAP-ARRA sunset, and, more generally, any decrease in SNAP benefits on the well-being of low-income households. Thus, our findings clearly indicate spill-over effects of the ARRA-SNAP benefit decrease due to the sunset that were not captured by previous studies. These differences reveal important information about the behaviors and coping strategies of low-income households as they respond to a negative shock to their income. Our findings suggest that low-income households may have attempted to offset the negative shock to their income due to the ARRA-SNAP sunset by searching for employment in the formal and informal labor market.

While the findings in this study are robust to several alternative assumptions, there are a few limitations that are worth reiterating. As with all public survey data, our results depend on the quality of self-reports of SNAP benefit receipt, which is known to be underreported. We attempted to address these concerns by using coarsened exact matching technology as well as performing balance test between two periods of time across two groups. However, administrative information on program participation would provide better estimates of the effect of the ARRA-SNAP sunset on expenditures and time use. To this extent, the findings in this study should be interpreted with caution.

References

Beatty, T.K., and C.J. Tuttle. 2015. Expenditure Response to Increases in In-kind Transfers: Evidence from the Supplemental Nutrition Assistance Program. *American Journal of Agricultural Economics* 97 (2): 390–404.

Blackwell, M., S.M. Iacus, G. King, and G. Porro. 2009. CEM: Coarsened Exact Matching in Stata. *The Stata Journal: Promoting Communications on Statistics and Stata* 9 (4): 524–46.

Coleman-Jensen, A., M.P. Rabbitt, C.A. Gregory, and A. Singh. 2017. Household Food Security in the United States in 2016. Washington DC: U.S. Department of Agriculture, Economic Research Service.

Congressional Budget Office. 2011. *Estimated Impact of the American Recovery and Reinvestment Act on Employment and Economic Output from January 2011 Through March 2011*. Washington DC: A CBO Report May 2011. URL: https://www.cbo.gov/sites/default/files/112th-congress-2011-2012/reports/05-25-arra.pdf.

Dean, S., and D. Rosenbaum. 2013. *SNAP Benefits Will Be Cut for Nearly All Participants in November 2013*. Washington DC: Center on Budget and Policy Priorities.

East, C. 2016. Immigrants' Labor Supply Response to Food Stamp Access. *Labour Economics* 51: 202–26.

Hagstrom, P. 1996. The Food Stamp Participation and Labor Supply of Married Couples: An Empirical Analysis of Joint Decisions. *Journal of Human Resources* 3 (2): 383–403.

Hall, J.P., A. Shartzer, N.K. Kurth, and K.C. Thomas. 2017. Effect of Medicaid Expansion on Workforce Participation for People with Disabilities. *American Journal of Public Health* 107 (2): 262–4.

Hoynes, H.W., and D.W. Schanzenbach. 2012. Work Incentives and the Food Stamp Program. *Journal of Public Economics* 96 (1): 151–62.

Hu, L., R. Kaestner, B. Mazumder, S. Miller, and A. Wong. 2016. The Effect of the Patient Protection and Affordable Care Act Medicaid Expansions on Financial Wellbeing. NBER Working Paper No. 22170

Gundersen, C., B. Kreider, and J. Pepper. 2017. Partial Identification Methods for Evaluating Food Assistance Programs: A Case Study of the Causal Impact of SNAP on Food Insecurity. *American Journal of Agricultural Economics* 99 (4): 875–94.

——.. 2018. Reconstructing SNAP to More Effectively Alleviate Food Insecurity in the U.S. *RSF: The Russell Sage Foundation Journal of the Social Sciences* 4 (2): 113–30.

Johnson, D.S., J.A. Parker, and N.S. Souleles. 2006. Household Expenditure and the Income Tax Rebates of 2001. *American Economic Review* 96 (5): 1589–610.

Kaestner, R., B. Garrett, J. Chen, A. Gangopadhyaya, and C. Fleming. 2017. Effects of ACA Medicaid Expansions on Health Insurance Coverage and Labor Supply. *Journal of Policy Analysis and Management* 36 (3): 608–42.

Katare, B., and J. Kim. 2017. Effects of the 2013 SNAP Benefit Cut on Food Security. *Applied Economic Perspectives and Policy* 39 (4): 662–81.

Kim, J. 2016. Do SNAP Participants Expand Non-Food Spending When They Receive More SNAP Benefits?—Evidence from the 2009 SNAP Benefits Increase. *Food Policy* 65: 9–20.

Meyer, B.D., and J.X. Sullivan. 2008. Changes in the Consumption, Income, and Well-Being of Single Mother Headed Families. *The American Economic Review* 98 (5): 2221–41.

Mulcahy, A.W., C. Eibner, and K. Finegold. 2016. Gaining Coverage through Medicaid or Private Insurance Increased Prescription Use and Lowered out-of-Pocket Spending. *Health Affairs* 35 (9): 1725–33.

Nord, M., and M. Prell. 2011. *Food Security Improved Following the 2009 ARRA Increase in SNAP Benefits*. Washington DC: U.S. Department of Agriculture, Economic Research Service.

Pew Issue Brief. 2016. Household Expenditures and Income. https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2016/03/household-expenditures-and-income. Accessed January 29, 2019.

Semega, J.L., K.R. Fontenot, and M.A. Kollar. 2017. Income and Poverty in the United States: 2016. Washington DC: U.S. Census Bureau, Current Population Reports: 60–259.