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In-kind benefits and household behavior: The impact of SNAP on food-away-from-home consumption☆

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ABSTRACT

Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program, provides in-kind benefits that can generally be utilized for Food At Home (FAH) only. According to economic theory, SNAP benefits are fungible with cash for inframarginal households which may allow participants to spend benefits on non-FAH items. However, empirical evidence for this theory is mixed. This paper exploits an underutilized source of state-level variation, the early-2000 s recession, to determine the impact of SNAP participation on household Food Away From Home (FAFH) consumption. In a difference in difference framework, I compare households in high post-recession SNAP growth states to households in low post-recession SNAP growth states. The results show that SNAP participation causes a significant decrease in FAFH expenditure and FAFH's share of total food expenditure.

1. Introduction

Supplemental Nutrition Assistance Program (SNAP) is a federal nutrition-assistance program that provides benefits to low-income households in the United States. While the program has been touted for successfully targeting food insecurity, it has also been criticized for having the unintended consequence of promoting poor diet and obesity. The food insecurity-obesity paradox (Dietz, 1995), which states that there is a positive association between the contradictory states of food insecurity and obesity, has long puzzled researchers. Intuitively, households that are unable to fulfill their nutrition needs should exhibit starvation. However, in practice food insecurity has been shown to be positively correlated with overweight and obesity, especially among women (Adams et al., 2003; Basiotis and Lino, 2003; Centers for Disease Control and Prevention, 2003; Dinour et al., 2007; Olson, 1999; Townsend et al., 2001). In particular, individuals in food insecure households who also participate in SNAP have a greater likelihood of obesity (Baum, 2011; Chen et al., 2005; Gibson, 2003; Meyerhoefer and Pylypchuk, 2008; Robinson and Zheng, 2011; Townsend et al., 2001).

SNAP may be linked to obesity through its influence on Food Away From Home (FAFH) consumption (Fox et al., 2004). Household FAFH consumption in the United States has steadily increased in recent years. Between the years 2004 and 2014, total FAFH expenditure on all eating and drinking places rose by about 63% (USDA ERS, 2016). Although SNAP benefits are restricted to be spent on Food At Home (FAH) only, households that spend more on food than the amount of SNAP benefits they receive can substitute current cash expenditure on food with SNAP dollars. These households are termed 'inframarginal' and the fungibility of SNAP benefits allows them to utilize benefits for purchases of SNAP-ineligible items such as FAFH. While this income effect exerts a positive influence on FAFH consumption, there are several factors that may lead to decreases in FAFH and FAFH's share of total food expenditure. First, food stamps may cater to the urgent need for food, leading to more grocery store trips shortly after benefit receipt. A study conducted by Cole (1997) found that food stamp recipients spend 23 percent of their monthly benefits on the first day of benefit receipt and 71 percent within the first week. Second, benefits earmarked for FAH may have a psychological effect due to which households may fail to accurately access the fungibility of SNAP benefits with cash (Fox et al., 2004). Third, intra-household bargaining in multiple income-earner households where food expenditure decisions are normally made by one individual can result in greater FAH expenditure relative to FAFH expenditure (Breunig and Dasgupta, 2005). Fourth, mental accounting, a theory which proposes that households group expenditures into categories (Thaler, 1999), can lead to greater FAH expenditure out of SNAP benefits. Overall, the impact of SNAP on FAFH consumption will depend on the magnitude of these effects relative to the income effect.

In this study, I test whether SNAP participation leads to changes in FAFH expenditure and FAFH's share of total food expenditure. I exploit the early-2000 s recession as a quasi-natural experiment to compare

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household FAFH changes in states that experienced large spikes in SNAP participation to FAFH changes in states that were less affected. Treatment is defined as high growth in state SNAP participation rate and a Difference In Difference (DID) model is utilized for estimation. Results show SNAP participation leads to a modest but statistically significant decrease in FAFH expenditure and FAFH share. As expected, the effect is stronger for households that are more likely to be treated, that is, have a higher likelihood of participating in SNAP as a result of the recession.

While these effects have been repeatedly theorized by researchers, there is sparse empirical evidence to determine the true effect of SNAP on FAFH consumption. Among a handful of studies, Hoynes and Schanzenbach (2009) rely on variation arising from county-level program introduction and find a negative but statistically insignificant association between SNAP participation and the likelihood of consuming FAFH. Beatty and Tuttle (2015) use increases in SNAP benefits due to the American Recovery and Reinvestment Act (ARRA) as a quasi-natural experiment and find a negative but statistically insignificant relationship between SNAP benefits and FAFH expenditure. Similarly, Kim (2016) uses the ARRA benefit increase and finds null results on the effect of SNAP on FAFH expenditures. Other methodologies have also been applied to test this relationship. Liu et al. (2013) use a multivariate sample selection procedure and find that SNAP negatively effects the probability and expenditure level of lunch and dinner away from home but only in single-person and husband-wife households with children. Pan and Jensen (2008) use a quadratic almost ideal demand system and show that SNAP has a significantly negative effect on FAFH expenditure.

A vast amount of literature exists on the health implications of FAFH. Although there is some debate among researchers regarding whether FAFH leads to obesity, literature shows that it generally leads to lower diet quality. FAFH tends to be more energy dense (Binkley, 2008) and less healthy than FAH (Mancino et al., 2009). Binkley (2008), Bowman et al. (2004), Paeratakul et al. (2003), and Todd et al. (2010) all find that fast food consumption leads to poor diet quality while the last two studies also find greater caloric intake as a consequence of fast food consumption. In contrast, You et al. (2009) show that due to non-monetary factors such as time, SNAP participants can consume a moderate amount of FAFH while maintaining a healthy and nutritious diet. In a related study, Davis and You (2011) determine that FAFH may also be less costly compared to FAH than previously thought when the time cost of food preparation is considered. Furthermore, there is some evidence that proximity to a fast food restaurant significantly increases the likelihood of obesity among children and pregnant women (Currie et al., 2010) and among non-white rural residents (Dunn et al., 2012). On the other hand, Anderson and Matsa (2011) determine that there is no causal link between food consumption at restaurants and obesity. Cai et al. (2008) conclude that neither FAH nor FAFH expenditures have a significant influence on overweight rates.

This paper adds to literature by presenting new evidence on the impact of SNAP on household FAFH consumption. Similar to Hoynes and Schanzenbach (2009), Beatty and Tuttle (2015), and Kim (2016), this paper uses a DID framework but shows that the decrease in FAFH expenditure and FAFH share, albeit modest, is statistically significant despite the prediction of the canonical economic model. I also provide evidence that in addition to a strong immediate FAFH consumption response, the effect is consistent over a long period of time. Finally, the use of an economic downturn as a quasi-natural experiment is a relatively new approach that has not been utilized in SNAP-related research, to the best of the author's knowledge.

This paper is organized in the following way. Section 2 provides a background of SNAP and the early 2000 s recession. Section 3 gives an overview of data and summary statistics. Section 4 presents descriptive evidence and elaborates on the research design. Section 5 explains the methodology employed in the construction of the empirical model.

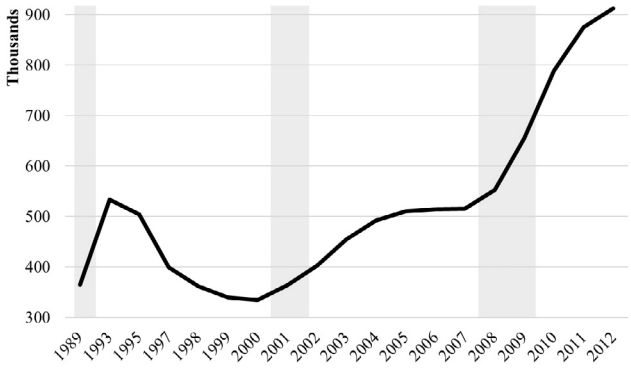

Fig. 1. National average SNAP caseloads.
Source: Economic Research Service (ERS), U.S. Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) Data System.

Section 6 presents results of the DID estimation. Section 7 includes a discussion of policy implications and section 8 concludes.

2. Background

In the past decade or so, SNAP has changed drastically. Fig. 1 shows the trend in national average SNAP participation rates from 1989 to 2012. Following the welfare reform of 1996 called the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), SNAP caseloads steadily declined nationwide. Changes made by PRWORA included the elimination of immigrant eligibility and replacement of the traditional Aid to Families with Dependent Children (AFDC) program with a state block grant called Temporary Assistance for Needy Families (TANF). Part of the decrease in SNAP caseloads can be explained by the consistent rise in income of households at the bottom 20% of the income distribution, rising from a mean of $8595 in 1996 to $10,157 in the year 2000 (US Census Bureau, 2015). Following this period of contraction in SNAP caseloads, participation sharply rebounded as the economy entered the early-2000 s recession.

This spike in SNAP caseloads in response to the recession can be mainly attributed to the relaxation of state eligibility requirements. In addition, poor households experienced a decline in income from a mean of $10,157 in the year 2000 to $9996 in 2003 (US Census Bureau, 2015). SNAP growth rates between the years 2000 and 2003 ranged from a maximum of 23.5% in Arizona to a minimum of −4.4% in Hawaii and between the years 2000 and 2011 ranged from 17% in Nevada to 4% in Hawaii (Economic Research Service, 2013). Shortly after the sudden increase, growth in SNAP enrollment started to plateau as the economy entered a period of recovery. However, the program experienced another large swell at the advent of the Great Recession of 2008. This increase subsided in the following years as the economy started to recuperate.

3. Data

Household-level samples are generated from the 1996–2011 cycles of the Current Population Survey Food Security Supplement (CPS-FSS). The CPS is a large national survey of the non-institutionalized civilian population conducted monthly and containing extensive labor-market and demographic information. The CPS-FSS is an annual supplement completed by about two-thirds of all CPS respondents and is conducted to elicit household-level information on issues regarding food security, food consumption, program participation, etc. The CPS-FSS provides self-reported measures of weekly FAFH expenditure and FAFH share.

Table 1 shows a descriptive snapshot of the sample generated from CPS-FSS. Households are categorized into two groups based on their state of residence. Households that reside in 15 states that experienced the largest post-recession growth in SNAP participation form the "High

Table 1
CPS food security supplement variable means by cohort.

Variable	High Growth	Low Growth	Difference
SNAP (%)	14.3	17	−2.70***
Weekly FAFH ($)	45.7	46.7	−1.08***
FAFH share (%)	35	35.6	−0.59***
Male (%)	53.8	53.6	−0.2
Age	49.5	49.6	−0.09*
Black (%)	10	11	1.0
College (%)	27.6	26	−1.6
Married (%)	52.4	50	2.4***
Employed (%)	64.3	62.7	1.60***
Student (%)	1.5	1.6	−0.1***
Number of HH members	2.5	2.5	−0.03***
Number of children	0.6	0.7	0.01
Family income < $15 K (%)	33	37.3	−4.3***

Note: High Growth cohort contains households that reside in any of the 15 states that had the highest post-recession SNAP growth rate and Low Growth cohort contains households that reside in any of the 15 states with the lowest post-recession SNAP growth rate.
* p < 0.10.
*** p < 0.01.

Growth" cohort and households that reside in 15 states that experienced the lowest post-recession growth in SNAP participation form the "Low Growth" cohort. Households in the two cohorts differ significantly across various socioeconomic measures. Average SNAP participation rate, weekly FAFH expenditure, and weekly FAFH share are all statistically significantly lower in the high growth cohort than the low growth cohort. The rest of the variables in Table 1 shows demographic characteristics of the representative household in the sample. The average household head's age, marital status, employment status, student status, number of household members, and family income are all statistically different in the two cohorts. Because heterogeneity across these demographics may confound comparison between the two cohorts, controlling for these variables in empirical estimation is necessary.

4. Research design

The central issue in any SNAP-related research is bias arising from selection into the program. To make causal inference, the researcher is tasked with isolating the effect of SNAP participation from other, often unobservable, factors that might influence the outcome variable. For example, households that have a stronger preference for FAFH may be more or less likely to participate in SNAP relative to other households. Many approaches have been taken to tackle the selection issue, including the use of various instrumental variables such as county SNAP participation rate (Burgstahler et al., 2012), state SNAP eligibility rules (Boonsaeng et al., 2012; Gregory and Coleman-Jensen, 2013; Ratcliffe et al., 2011), and percentage of benefits issued by EBT in the respondent's state (Yen et al., 2008). Other researchers have relied on DID approaches, using quasi-natural experiments such as the county-level introduction of SNAP (Hoynes and Schanzenbach, 2009), the instatement of American Recovery and Reinvestment Act (ARRA) in 2009 which temporarily increased benefit disbursement (Beatty and Tuttle, 2015; Kim, 2016), and the subsequent elimination of ARRA in 2013 (Bruich, 2014).

I follow the footsteps of the latter group of researchers and employ a DID approach by utilizing the recession of 2001 as a quasi-natural experiment. The economic slump at the turn of the century led to a rise in SNAP caseloads in almost all states in the country, reversing the downward trend of the mid to late nineties. However, there is considerable state variation in participation growth during this period. Some states experienced a sharp rise in SNAP participation rates while others saw a gradual increase or even a decrease. This variation forms the crux of the DID research design.

Table 2
Average Growth in SNAP participation rate between 2000 and 2011 by cohort.

High Growth		Low Growth	
Nevada	16.9%	California	7.6%
Delaware	14.5%	New York	7.6%
Idaho	14.0%	Missouri	7.5%
Arizona	13.6%	Nebraska	7.5%
Wisconsin	13.4%	Illinois	7.4%
Utah	13.0%	Mississippi	7.3%
Massachusetts	12.8%	Montana	6.9%
Florida	12.7%	Kentucky	6.6%
Washington	12.4%	Arkansas	6.3%
North Carolina	11.6%	Washington DC	5.7%
New Hampshire	11.5%	Louisiana	5.6%
Maryland	11.4%	North Dakota	5.0%
Georgia	11.3%	Wyoming	4.8%
Michigan	10.9%	West Virginia	4.3%
Colorado	10.8%	Hawaii	4.0%

Source: USDA Economic Research Service, SNAP Data System.

4.1. Treatment and control groups

Treatment is assigned based on state SNAP growth rates. The treatment group, referred to as the high growth cohort, includes 15 states that had the highest growth rate in SNAP participation from the years 2000 to 2011. The control group, referred to as the low growth cohort, includes 15 states that saw the lowest growth in SNAP participation during the same time period. Table 2 shows states in each cohort and their participation growth rates. It follows that the average household residing in high growth states has the highest probability of post-recession SNAP participation and the average household in low growth states has the lowest probability of post-recession SNAP participation. Fig. 2 shows the average percentage change in SNAP participation levels indexed to the year 2000 for the high growth and low growth cohorts. SNAP participation changes relative to the base year are largely similar in each cohort prior to the year 2000. However, at the start of the recession, total SNAP caseloads increase much more in the high growth cohort relative to the low growth cohort. This divergence in SNAP participation lends credence to the notion that the recession was the primary catalyst for the resulting heterogeneity in SNAP growth between the two cohorts.

Unbiased estimation of the DID model is contingent on the validity of the parallel trends assumption. That is, pre-recession FAFH trends are similar in the two cohorts. Fig. 3 shows annual aggregate FAFH expenditure in each cohort using data from the CPS-FSS. Note that FAFH expenditure variable was not included in the 1998 cycle of the CPS-FSS. For exposition, the 1998 value shown in Fig. 3 is simply the average of FAFH expenditures in 1997 and 1999. Until the early 2000 s, FAFH expenditure is relatively similar in the two cohorts. However, after the year 2002 there is an unambiguous divergence between the high growth and low growth groups, with FAFH expenditure increasing to a

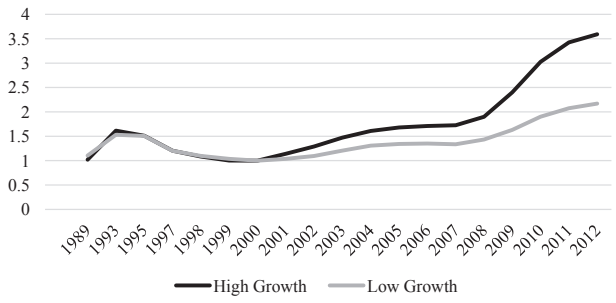

Fig. 2. Changes in SNAP participation in high growth and low growth cohorts: Index = 2000.
Source: Economic Research Service (ERS), U.S. Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) Data System.

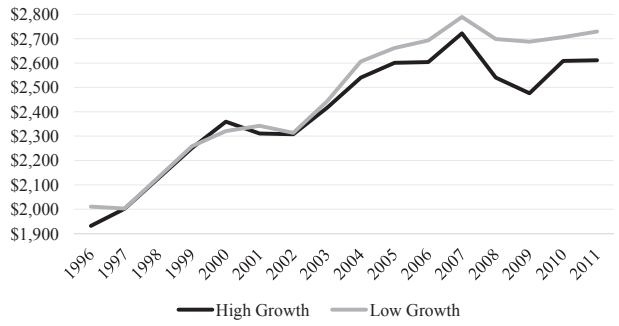

Fig. 3. Annual aggregate FAFH expenditure.
Source: Current Population Survey Food Security Supplement, 1996–2011.

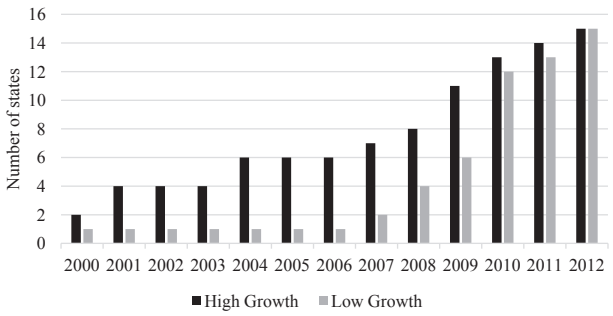

Fig. 4. BBCE adoption of high growth and low growth states by year.
Source: Economic Research Service (ERS), U.S. Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) Policy Database.

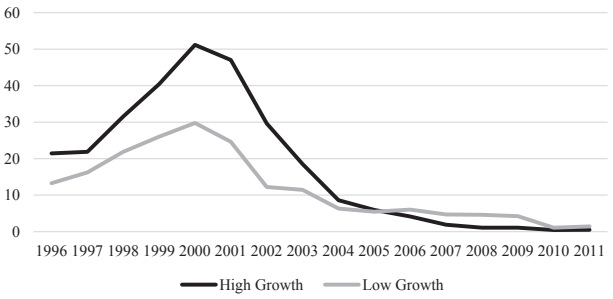

Fig. 5. Percentage of SNAP households with recertification period of 1–3 Months.
Source: Economic Research Service (ERS), U.S. Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) Policy Database.

smaller extent in the high growth cohort. Together, Figs. 2 and 3 provide strong evidence for parallel trends and that SNAP is the main cause behind the muted increase in FAFH expenditure of the high growth cohort. I also conduct an empirical test of the parallel trends assumption following the approach of Autor (2003). The results, provided in Table 5 and elaborated in Section 6, are well-aligned with graphical evidence.

For the DID estimator to be unbiased, SNAP participation changes in control states need to be completely independent of the early-2000 s recession. A limitation of this study's research design is that households in control states are exposed to treatment because control states experience some growth in SNAP participation due to the recession, albeit at a lower rate. As a result, the DID relies on variation in state participation growth rates instead of simply comparing states that experienced participation growth with states that did not. This understates the true impact of SNAP on FAFH consumption as it imposes a downward bias on the DID estimator. However, results show a statistically significant effect despite this attenuation. This indicates that the true effect is likely stronger than the estimates of the DID model.

It should be noted that while the divergence in SNAP participation occurred in the year 2000, the resulting divergence in FAFH expenditures between the two cohorts did not manifest until the year 2002 in Fig. 3. The delayed response of FAFH consumption to the recession might be explained by the theory that households generally exhibit habitual consumption of food, the empirical evidence of which is well-established in literature (Browning and Collado, 2007; Carrasco et al., 2005; Dynan, 2000; Heien and Durham, 1991; Khare and Inman, 2006; Naik and Moore, 1996; Richards et al., 2007). As a result, intertemporal dependence on food purchases might delay households in altering consumption behavior immediately after exposure to treatment. Also note that the results shown in Table 5 depict a divergence in trends between the two cohorts starting in the year 2001.

4.2. The early 2000 s recession

The early-2000 s recession led to state-level variation in SNAP participation primarily through state policy changes. Other factors such as income and poverty explain only a small portion of state variation in SNAP caseloads.

4.2.1. State policy changes

In response to the recession, high growth states were quicker and more amenable to either streamline administration or implement direct policy changes to relax the SNAP eligibility criteria relative to low growth states. Ganong and Liebman (2013) study changes in SNAP enrollment and determine that state policy changes were one of the main reasons for increases in SNAP participation during the period 2001–2007. Two major SNAP policies are Broad Based Categorical Eligibility (BBCE) and recertification periods. BBCE allows participants of other programs such as Temporary Assistance for Needy Families (TANF) to automatically qualify for SNAP benefits. Fig. 4 shows the cumulative number of states in each cohort that had adopted BBCE in each year since 2000. As the figure shows, most of the states in the low growth cohort adopted BBCE as a result of the Great Recession of 2008 while several high growth states adopted BBCE in the earlier part of the decade. Similarly, Fig. 5 shows the percentage of households in each cohort that were required to seek recertification within a 1–3 month period as opposed to longer time intervals. Short recertification periods impose a transaction cost and make it easier for a household to become ineligible. As shown in Fig. 5, the proportion of households with short recertification periods declines sharply following the start of the early-2000 s recession. However, the drop in high growth states is clearly more substantial than their low growth counterparts. This pattern is consistent across policies that reduce the transaction cost of participation as well. Examples include the elimination of the requirement that participants report any changes in income and living conditions regularly (called simplified reporting), the use of telephone interviews instead of in-person interviews at recertification without documenting household hardship, and use of online SNAP applications. Moreover, following the approach of Ganong and Liebman (2013), I construct an index of eight major SNAP policies. Fig. 6 depicts changes in the policy index by cohort for the sample period. While states in both cohorts responded to the recession, the high growth cohort more readily adopted these policies relative to the low growth cohort. This pattern was consistent throughout most of the decade.

4.2.2. State income changes

The identification strategy relies on the assumption that apart from its impact on SNAP participation, there are no other factors through which the recession differentially affected FAFH consumption in the two cohorts. In other words, there are no unaccounted-for variables that confound the impact of SNAP participation on FAFH and therefore FAFH is unrelated to the recession except through changes in SNAP participation. A variable that may undermine this assumption is household income. During a recession, declining income may cause households to divert their spending away from FAFH which is generally

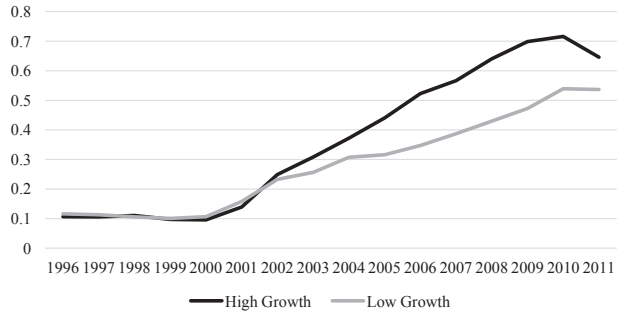

Fig. 6. SNAP policy index by Cohort, 1996 to 2011.
Source: Economic Research Service (ERS), U.S. Department of Agriculture (USDA). Supplemental Nutrition Assistance Program (SNAP) Policy Database. Note: The SNAP Policy Index is calculated by summing monthly indicators for eight policies and dividing by 8. The eight polices include broad based categorical eligibility, exclusion of at least one vehicle from the SNAP asset test, availability of call centers in at least part of the state, use of a combined application project for SSI recipients, face-to-face recertification waiver, online application, simplified reporting, and certification longer than three months.

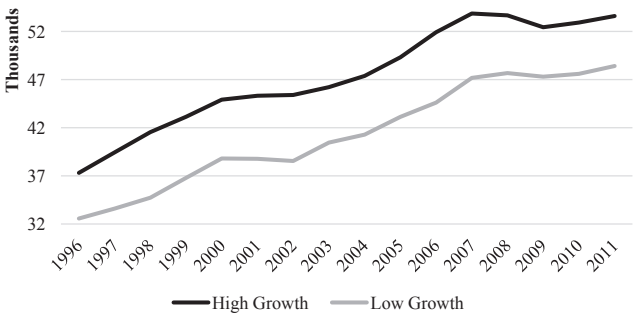

Fig. 7. Median Income by Cohort, 1996 to 2011.
Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements.

considered more expensive than FAH. Todd and Morrison (2014) show that during the Great Recession of 2008 working-age adults decreased FAFH consumption by 12% and calories obtained from fast food and pizza places decreased by about 53%. If the effect of income on FAFH expenditure is not accounted for, DID estimator may be upward biased.

While baseline differences exist between the two cohorts (as shown in Table 1), descriptive and empirical evidence shows that the difference in the effect of the early 2000 s recession on household income between the two groups is somewhat small. That is, households in the high growth cohort did not experience a substantially larger change in income than households in the low growth cohort. This is illustrated in Fig. 7 that shows state median income by cohort. In addition, a "double difference" approach shows that during the years 2001 to 2003 the increase in median income was only 0.6% smaller and in average-annual wages and salaries was about 1% greater in the high growth cohort than the low growth cohort.[1] In addition, average state poverty rate between 2001 and 2003 decreased by only about 1.3% less in high growth states than in low growth states.[2] For comparison, total SNAP benefits in the high growth cohort rose by 11% during this time period.[3]

5. Methodology

The strength of the DID approach relies on the key assumption that trends in FAFH expenditure would have been similar for both high growth and low growth cohorts in the absence of treatment. Although differences among households in the two cohorts can exist, observable variation is captured by the inclusion of household demographic variables and unobservable variation is partially accounted for by state and year fixed effects. The DID model is given by the following equation:

$$FAFH_i = \tau Post_t * Highgrowth_s + \rho X_i + \varphi Income_i + \theta_s + \delta_t + \varepsilon_i \quad (1)$$

where $FAFH_i$ measures weekly FAFH expenditure and FAFH as a share of total food expenditure for household i. The variable of interest is the interaction between the intervention dummy, $Post_t$, which equals 1 if the household is observed after the start of the year 2001, and the treatment group indicator $Highgrowth_s$, which equals 1 if the household resides in a state in the high growth cohort. The interaction term $Post_t * Highgrowth_s$ captures the effect of the recession on high growth states relative to low growth states and determines the impact of SNAP participation on household FAFH consumption. The coefficient τ can be interpreted as the average dollar change in household FAFH expenditures or the average percentage point change in household FAFH share in high growth states relative to households in low growth states.

The vector X_i contains household-level covariates such as age of the household head, number of household members, number of children in the household, etc., $Income_i$ contains binary variables for each category of annual household income, θ_s and δ_t capture state and year fixed effects respectively, and ε_i is the error term. The inclusion of state and year fixed effects is important as they remove any baseline unobservable variation through which the early-2000 s recession might influence FAFH expenditure independent of its effect through SNAP participation. State fixed effects account for this heterogeneity as long as it is time-invariant and year fixed effects account for unobservable time effects that do not differ by state.

In addition to estimation of the baseline model using the full sample of 15 states in each cohort, I estimate additional specifications by restricting the sample to households with a higher likelihood of participating in SNAP in response to the recession. First, high growth and low growth cohorts are redefined to include only the 10 highest growth states and 10 lowest growth states respectively. Consequently, the average household in the high (low) growth cohort of 10 states has a higher (lower) likelihood of participation in response to the early-2000 s recession relative to the average household in the high (low) growth cohort of 15 states. Second, I estimate a specification of the model that excludes households with an annual income below $25,000. The federal SNAP eligibility criteria specifies a gross income limit of 130% of Federal Poverty Guidelines with exceptions for elderly and disabled households. For a family of four, this threshold translated to about $23,000 annual income in the year 2001, about $24,000 in the year 2003, and exactly $26,000 by the year 2006. As a result, households with annual income under $25,000 are mostly those that already qualified for the program according to pre-recession eligibility requirements and were likely already participating before the recession. On the other hand, the group of households with an annual income above $25,000 includes those that are on the margin of being eligible for the program and consequently have a higher probability of participating in response to the recession. Third, I estimate a DID model by limiting the sample to the years 1999 to 2002 to elicit the immediate effect of SNAP participation. This specification captures the effect of participation on FAFH consumption within a year of exposure to the treatment and will determine the short-term impact of SNAP.

Even though changes in income between the two cohorts were somewhat small, I include household income as a covariate to remove any remaining confounding effect. The CPS-FSS provides a categorical measure of income with relatively narrow income bins, especially for low-income households. Baseline differences between the high growth

[1] Income change is calculated based on data obtained from the US Census Bureau, Current Population Survey, Annual Social and Economic Supplements and wages and salaries change is calculated based on US Department of Commerce's Bureau of Economic Analysis, Regional Economic Accounts.

[2] Calculated based on data obtained from the US Census Bureau, Current Population Survey, Annual Social and Economic Supplements.

[3] Calculated using data obtained from the USDA Economic Research Service, SNAP Data System.

Table 3
Difference in difference estimates on weekly FAFH expenditure and FAFH share.

	FAFH Expense	FAFH Share			
	Full sample	Full sample	20 States	Income > $25 K	Immediate effect
Post*High Growth	−1.473	−0.774**	−1.177**	−0.807**	−0.825*
	(0.90)	(0.35)	(0.47)	(0.32)	(0.43)
Observations	271,363	240,478	123,460	175,078	85,481

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. All specifications include household income and demographics as covariates. Full set of results is shown in Table 3-A in the Appendix.
* p < 0.10.
** p < 0.05.

and low growth cohorts are accounted for by state fixed effects. As a result, the effect of income is largely removed and the main source of identification is variation in the state eligibility criteria.

6. Results

Table 3 shows results of the DID model. All specifications include controls for household income, household demographics, and state and year fixed effects. Column I of Table 3 specifies household weekly FAFH expenditure as the outcome variable and is estimated for a sample of 271,363 households over the period 1996 to 2011. This specification allows for a larger sample due to additional data available for the years 1996 and 1997. The results show that weekly FAFH expenditure decreased by about $1.47 in high growth states relative to low growth states resulting from increased SNAP participation, although the estimate is statistically insignificant. Columns II through V specify FAFH's share of total food expenditure as the outcome variable. Column II shows estimates obtained from the full sample. Weekly FAFH share decreased by about 0.77% in high growth states relative to low growth states following the SNAP increase. In other words, FAH consumption rose by 0.77% in high growth states relative to low growth states. Column III presents results from the sample that redefines high growth and low growth cohorts to include 10 states each. The effect is substantially large which implies that increasing exposure to treatment causes a stronger FAFH response. Column IV shows estimates from the restricted model of households with annual income greater than $25,000. The coefficient from this specification shows a 0.81% decrease in FAFH share. This specification provides the strongest evidence of the effect of SNAP on FAFH consumption as households on the margin of SNAP eligibility are most likely to participate following the recession. Finally, column V of Table 3 presents estimates from a restricted sample including years 1999 to 2002 only. The immediate effect of residing in a high growth state is a 0.83% decrease in FAFH share. To further explore the heterogeneous effect of income, Table 4 juxtaposes estimates from the restricted sample of households with income below $25,000 with the sample of households with income above $25,000. As expected, the FAFH response of households with income below $25,000 is smaller in magnitude and statistically insignificant.

I provide an empirical test of the parallel trends assumption by including leads (pre-recession interactions) and lags (post-recession interactions) in the DID model with results shown in Table 5. Autor (2003) provides a more detailed explanation of this strategy. The model interacts year dummies with the treatment variable $Highgrowth_s$ to compare the yearly treatment effect relative to the baseline period. Columns I and II show results of the regression on FAFH expenditure and FAFH share respectively. Since the year 1996 was unlike the following years in the decade due to the passage of PRWORA, I consider both 1996 and 1997 baseline years for the FAFH expenditure regression. Recall that the year 1998 is not included in the analysis due to the absence of FAFH expenditure variable in the CPS-FSS that year. In addition, the CPS-FSS does not include measures for FAFH share prior to the year 1999. Results show that lead variables are statistically insignificant, which indicates parallel trends. Moreover, the coefficients on the lag variables exhibit a clear trend reversal, with FAFH consumption in high growth states experiencing a sharper plummet relative to low growth states. This divergence not only persists but invariably grows in later years.

Table 4
Difference in difference estimates on weekly FAFH expenditure and FAFH share by household income.

	Income > $25 K		Income ≤ $25 K	
	FAFH Expenditure	FAFH Share	FAFH Expenditure	FAFH Share
Post*High Growth	−1.540	−0.807**	−1.058	−0.577
	(1.0)	(0.32)	(0.82)	(0.58)
Observations	195,098	175,078	76,265	65,400

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. All specifications include household income and demographics as covariates. Full set of results is shown in Table 4-A in the Appendix.
** p < 0.05.

Table 6 presents additional tests for the robustness of the DID model. To examine the possibly confounding effect of income on household FAFH expenditure, I estimate a DID model by assigning treatment to states based on changes in income rather than SNAP growth rate. The 15 states with the smallest growth in income from the year 2001 to 2003 are categorized as treatment states while 15 states with the largest income growth during the same period are categorized as control states. If FAFH changes are driven by income instead of SNAP participation, the DID model will yield an estimate similar in magnitude to the estimate of the original regression (Eq. (1)). However, that is not the case. Columns I and II show that the FAFH expenditure estimate has attenuated and the FAFH share estimate has a positive sign. Moreover, both estimates are statistically insignificant. To capture other confounding effects I include state unemployment rate as a covariate in the original regression. The results, given in columns III and IV, show that while the estimate for FAFH expenditure is considerably smaller, the estimate for FAFH share is somewhat similar in magnitude to the original regression. Therefore, while unemployment rates may explain a

Table 5
Difference in difference estimates on weekly average FAFH expenditure and FAFH share with leads and lags.

	FAFH Expense	FAFH Share
1999*High Growth	0.076	–
	(0.76)	–
2000*High Growth	0.559	0.848
	(1.0)	(0.52)
2001*High Growth	−0.98	−0.452
	(1.04)	(0.5)
2002*High Growth	−0.62	−0.138
	(1.1)	(0.48)
2003*High Growth	−1.006	−0.046
	(1.56)	(0.65)
2004*High Growth	−1.327	−0.603
	(1.45)	(0.64)
2005*High Growth	−1.223	0.221
	(1.66)	(0.57)
2006*High Growth	−1.512	−0.236
	(1.13)	(0.55)
2007*High Growth	−0.882	0.294
	(1.7)	(0.53)
2008*High Growth	−2.333*	−0.637
	(1.19)	(0.54)
2009*High Growth	−2.540**	−0.902
	(1.24)	(0.63)
2010*High Growth	−0.979	−0.928
	(1.41)	(0.62)
2011*High Growth	−1.573	−0.629
	(1.11)	(0.51)
Observations	271,363	240,478

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. All specifications include household income and demographics as covariates. Income measures include binary variables for each category. Demographics are given in Table 1.
* p < 0.10.
** p < 0.05.

large portion of the FAFH expenditure decrease, they do not influence by much the drop in FAFH's share of total food expenditure. Finally, I interact the variable $Post_t * Highgrowth_s$ in Eq. (1) with state unemployment rates to present Difference-in-Difference-in-Difference (DDD) estimates. The coefficients of the DDD term, presented in columns V and VI, show that state unemployment rate does not have a statistically significant impact on the relationship between SNAP participation and the two measures of FAFH consumption.

Table 7
Difference in difference estimates on weekly average FAFH expenditure and FAFH share – continuous treatment.

	Baseline		With unemployment	
	FAFH Expense	FAFH Share	FAFH Expense	FAFH Share
Post*SNAP Growth Rate	−0.047	−0.043**	−0.024	−0.040**
	(0.03)	(0.02)	(0.03)	(0.02)
Observations	455,641	405,382	455,641	405,382

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. All specifications include household income and demographics as covariates. Full set of results is shown in Table 7-A in the Appendix.
** p < 0.05.

6.1. Continuous treatment assignment[4]

Recall that in Eq. (1), binary treatment is assigned based on a state's post-recession SNAP growth rate. This strategy allows for a comparison to be made between states with high exposure to treatment and those with low exposure to treatment, focusing on states where the effect of SNAP would presumably be most salient. Precedence for this identification strategy is found in Kaestner et al. (2003), who study the impact of welfare reform on teenage behaviors in a DID framework by characterizing teens as "high-risk" or "low-risk" of treatment based on socioeconomic status. Nonetheless, I utilize the continuous nature of the SNAP growth rate variable to estimate the following regression:

$$FAFH_i = \varphi Post_t * SNAPGrowthRate_s + \gamma SNAPGrowthRate_s + \rho X_i + \varphi Income_i + \theta_s + \delta_t + \varepsilon_i \quad (2)$$

where the variable of interest in Eq. (2) is the interaction between the post-recession dummy and state SNAP growth rate after the year 2001. Note that φ represents the effect of a one percentage point change in SNAP growth rate on FAFH expenditure and FAFH share. The rest of the variables are identical to Eq. (1). This model follows the research design implemented by Acemoglu et al. (2004) who interact military mobilization rates during World War II with a post-event dummy to determine the impact of female labor supply on wages.

Estimates of parameters in Eq. (2) are shown in Table 7 and full results are reported in Table 7-A in the Appendix A. Results of the baseline model shown in columns I and II depict that a one percentage point increase in the state SNAP growth rate leads to $0.05 reduction in

Table 6
Difference in difference estimates on weekly average FAFH expenditure and FAFH share – tests of robustness.

	Treatment by changes in income		Including State unemployment rate		Triple differences	
	FAFH Expense	FAFH Share	FAFH Expense	FAFH Share	FAFH Expense	FAFH Share
Post*Treat	−0.924	0.218	−1.066	−0.727**	0.695	0.109
	(0.97)	(0.36)	(0.91)	(0.35)	(3.09)	(1.99)
Post*Treat*UE Rate	–	–	–	–	−0.181	−0.04
	–	–	–	–	(0.74)	(0.51)
Observations	246,688	219,499	271,363	240,478	271,363	240,478

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. All specifications include household income and demographics as covariates. Full set of results is shown in Table 6-A in the Appendix.
Note 3. UE Rate refers to Unemployment Rate.
** p < 0.05.

[4] I thank an anonymous reviewer of this journal for suggesting this approach.

weekly household FAFH expenditure and a 0.043% decrease in FAFH's share of total food expenditure. Columns III and IV control for state unemployment rate. Although the magnitude φ in the FAFH expenditure regression drops drastically, the coefficient on FAFH share is comparable to the baseline.

7. Policy implications

According to economic theory, in-kind benefits are similar to equivalent cash transfers for inframarginal households. Consequently, these households cannot be restricted to spend SNAP benefits on FAH only because benefits are fungible with cash. In this case, participation would not lead to a decrease, and might even result in an increase, in FAFH expenditure as the income effect of SNAP benefits will cause households to increase expenditure on both FAFH and FAH. However, empirical evidence for this theory is mixed at best. In addition to the contributions by Hoynes and Schanzenbach (2009) and Beatty and Tuttle (2015), a recent experiment conducted by Lusk and Weaver (2017) concludes that in-kind transfers are no different from cash transfers for inframarginal households. Although, established economic theory does not take into account factors other than income that may exert downward influence on FAFH consumption (as outlined in Section 1).

The results of the model developed in this study show that SNAP participation not only leads to a decrease in FAFH expenditure but also in FAFH as a share of total food expenditure. As a consequence, the restriction on using SNAP benefits for FAFH expenditure is effective in altering behavior for most participants. This indicates that the magnitude of the income effect is not large enough to offset the magnitude of non-income factors that decrease FAFH consumption. The findings of Beatty and Tuttle (2015) corroborate the results of this paper. The authors show that the marginal propensity to consume FAH out of SNAP benefits is substantially higher than that out of cash income. Hastings and Shapiro (2017) show the same result for all SNAP-eligible foods. The results of Kim (2016) may also shed some light on the results of this study. The author shows that while SNAP leads to greater expenditure on other restricted goods such as rent and transportation, it has almost no effect on FAFH. This implies that FAFH may be a unique case for which the predictions of economic theory do not apply. Therefore, while economic literature has largely emphasized the income effect of SNAP, an in-depth exploration of the non-income factors is still needed.

8. Conclusion

This study tests the relationship between SNAP participation and household FAFH consumption. I exploit an underutilized source of state-level variation in SNAP caseloads, the early-2000 s recession, to identify a DID model. The treatment group consists of households that reside in 15 states with the highest participation growth rate and the control group consists of households that reside in 15 states with the lowest participation growth rate following the recession. Results show that households in high growth states reduce FAFH expenditure by approximately $1.47 and FAFH share by about 0.77% relative to their low growth counterparts. The effect is manifest immediately following the event of the recession but also persists over the long run. These results are robust to a series of robustness tests which lend validity to the research design. Therefore, SNAP has been successful, albeit modestly, at encouraging households to consume more FAH relative to FAFH.

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Appendix A

See Tables 3-A, 4-A, 6-A and 7-A.

Table 3-A
Difference in difference estimates on weekly FAFH expenditure and FAFH share.

	FAFH Expense	FAFH Share			
	Full sample	Full sample	20 States	Income > $25 K	Immediate effect
Post*High Growth	−1.473	−0.774**	−1.177**	−0.807**	−0.825*
	(0.9)	(0.35)	(0.47)	(0.32)	(0.43)
Male	4.962***	2.569***	2.475***	2.093***	2.563***
	(0.37)	(0.13)	(0.15)	(0.14)	(0.18)
Age	−0.168***	−0.116***	−0.117***	−0.117***	−0.118***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Black	−9.826***	−0.042	−0.287	−0.072	−0.953**
	(1.47)	(0.38)	(0.63)	(0.41)	(0.39)
College	2.697***	0.512***	0.405**	0.488***	1.086***
	(0.28)	(0.12)	(0.16)	(0.14)	(0.21)
Married	−2.398***	−3.626***	−3.313***	−3.947***	−3.881***
	(0.36)	(0.24)	(0.29)	(0.24)	(0.35)
Employed	1.066**	0.254*	−0.08	−0.137	0.291
	(0.43)	(0.15)	(0.21)	(0.18)	(0.24)
Student	2.414***	3.229***	3.778***	0.401	3.720***
	(0.86)	(0.46)	(0.68)	(0.61)	(0.95)
No. of HH Members	2.657***	−3.280***	−3.348***	−3.330***	−3.419***
	(0.31)	(0.16)	(0.25)	(0.15)	(0.22)
No. of Children in HH	−4.508***	−0.982***	−0.860***	−0.760***	−0.976***
	(0.24)	(0.12)	(0.21)	(0.12)	(0.16)
$0 < Family Income < $5000	−14.963***	−4.386***	−3.916***	–	−3.871***
	(1.02)	(0.51)	(0.9)	–	(0.9)
$5000 < Family Income < $7499	−19.057***	−6.416***	−5.714***	–	−7.829***
	(0.94)	(0.62)	(0.63)	–	(0.83)
$7500 < Family Income < $9999	−19.082***	−5.236***	−3.698***	–	−6.476***
	(1.44)	(0.62)	(0.77)	–	(0.54)
$10,000 < Family Income < $12,499	−17.233***	−5.668***	−4.874***	–	−5.437***
	(1.02)	(0.35)	(0.57)	–	(0.74)
$12,500 < Family Income < $14,999	−16.996***	−5.565***	−5.872***	–	−4.886***
	(1.01)	(0.34)	(0.55)	–	(0.55)
$15,000 < Family Income < $19,999	−15.661***	−4.583***	−4.584***	–	−4.284***
	(0.96)	(0.37)	(0.54)	–	(0.42)
$20,000 < Family Income < $24,999	−13.567***	−4.323***	−4.071***	–	−4.330***
	(1)	(0.28)	(0.36)	–	(0.47)
$25,000 < Family Income < $29,999	−11.742***	−3.659***	−3.752***	–	−2.613***
	(0.9)	(0.28)	(0.48)	–	(0.42)
$30,000 < Family Income < $34,999	−9.151***	−3.162***	−2.856***	0.546**	−2.657***
	(0.77)	(0.27)	(0.4)	(0.26)	(0.36)
$35,000 < Family Income < $39,999	−7.364***	−2.833***	−2.502***	0.899***	−1.819***
	(0.82)	(0.28)	(0.33)	(0.3)	(0.43)
$40,000 < Family Income < $49,999	−4.539***	−2.431***	−2.490***	1.329***	−1.722***
	(0.73)	(0.27)	(0.37)	(0.32)	(0.43)
$50,000 < Family Income < $59,999	−0.442	−1.501***	−1.291***	2.314***	−1.230***
	(0.86)	(0.28)	(0.4)	(0.35)	(0.35)
$60,000 < Family Income < $74,999	3.598***	−0.974***	−0.803**	2.885***	−0.068
	(0.66)	(0.27)	(0.35)	(0.34)	(0.29)
$75,000 < Family Income	24.791***	2.260***	2.228***	6.187***	3.092***
	(0.82)	(0.27)	(0.42)	(0.37)	(0.34)
Constant	44.579***	53.145***	53.050***	49.888***	53.300***
	(1.55)	(0.57)	(0.72)	(0.62)	(0.82)
Observations	271,363	240,478	123,460	175,078	85,481

Note. All specifications include state and year fixed effects and cluster-robust standard errors.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 4-A
Difference in difference estimates on weekly FAFH expenditure and FAFH share by household income.

	Income > $25 K		Income ≤ $25 K	
	FAFH expenditure	FAFH share	FAFH expenditure	FAFH share
Post*High Growth	−1.540	−0.807**	−1.058	−0.577
	(1)	(0.32)	(0.82)	(0.58)
Male	4.766***	2.093***	5.238***	3.749***
	(0.49)	(0.14)	(0.35)	(0.29)
Age	−0.162***	−0.117***	−0.148***	−0.108***
	(0.02)	(0.01)	(0.01)	(0.01)
Black	−11.185***	−0.072	−7.195***	0.313
	(1.68)	(0.41)	(0.98)	(0.51)
College	2.176***	0.488***	4.245***	0.378
	(0.32)	(0.14)	(0.41)	(0.29)
Married	−3.473***	−3.947***	−0.099	−3.111***
	(0.45)	(0.24)	(0.58)	(0.34)
Employed	−0.638	−0.137	3.997***	0.971***
	(0.6)	(0.18)	(0.4)	(0.24)
Student	2.21	0.401	2.863**	4.702***
	(1.42)	(0.61)	(1.07)	(0.69)
No. of HH Members	1.895***	−3.330***	4.466***	−3.153***
	(0.33)	(0.15)	(0.34)	(0.24)
No. of Children in HH	−3.792***	−0.760***	−5.890***	−1.496***
	(0.26)	(0.12)	(0.39)	(0.23)
$5000 < Fam. Income < $7499	–	–	−12.628***	−3.978***
			(0.88)	(0.6)
$7500 < Fam. Income < $9999	–	–	−16.459***	−5.770***
			(0.8)	(0.71)
$10,000 < Fam. Income < $12,499	–	–	−16.550***	−4.730***
			(1.33)	(0.65)
$12,500 < Family Income < $14,999	–	–	−15.195***	−5.225***
			(0.94)	(0.44)
$15,000 < Family Income < $19,999	–	–	−15.229***	−5.195***
			(0.95)	(0.36)
$20,000 < Family Income < $24,999	–	–	−14.245***	−4.270***
			(0.88)	(0.39)
$25,000 < Family Income < $29,999	–	–	−12.514***	−4.086***
			(0.96)	(0.35)
$30,000 < Family Income < $34,999	2.771***	0.546**	–	–
	(0.39)	(0.26)		
$35,000 < Family Income < $39,999	4.729***	0.899***	–	–
	(0.36)	(0.3)		
$40,000 < Family Income < $49,999	7.714***	1.329***	–	–
	(0.42)	(0.32)		
$50,000 < Family Income < $59,999	12.052***	2.314***	–	–
	(0.41)	(0.35)		
$60,000 < Family Income < $74,999	16.341***	2.885***	–	–
	(0.63)	(0.34)		
$75,000 < Family Income	37.794***	6.187***	–	–
	(1.4)	(0.37)		
Constant	35.945***	49.888***	35.639***	52.354***
	(1.35)	(0.62)	(1.16)	(0.9)
Observations	195,098	175,078	76,265	65,400

Note. All specifications include state and year fixed effects and cluster-robust standard errors.
** p < 0.05.
*** p < 0.01.

Table 6-A
Difference in difference estimates on weekly FAFH expenditure and FAFH share – Tests of robustness.

	Treatment by changes in income		State unemployment rate		Triple differences	
	FAFH expenditure	FAFH share	FAFH expenditure	FAFH share	fafh expenditure	FAFH share
Post*Treat	−0.924	0.218	−1.066	−0.727**	0.695	0.109
	(0.97)	(0.36)	(0.9)	(0.35)	(3.09)	(1.99)
Post*UE Rate	–	–	–	–	0.980***	0.425
	–	–	–	–	(0.32)	(0.28)
Treat*UE Rate	–	–	–	–	0.157	−0.12
	–	–	–	–	(0.74)	(0.5)
Post*Treat*UE Rate	–	–	–	–	−0.181	−0.04
	–	–	–	–	(0.74)	(0.51)
Male	5.189***	2.621***	4.968***	2.570***	4.963***	2.570***
	(0.37)	(0.14)	(0.37)	(0.13)	(0.37)	(0.13)
Age	−0.155***	−0.107***	−0.168***	−0.116***	−0.168***	−0.116***
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Black	−10.254***	−0.047	−9.828***	−0.042	−9.817***	−0.037
	(1.6)	(0.38)	(1.46)	(0.38)	(1.45)	(0.38)
College	2.760***	0.660***	2.701***	0.513***	2.707***	0.516***
	(0.34)	(0.15)	(0.28)	(0.12)	(0.28)	(0.12)
Married	−2.191***	−3.397***	−2.396***	−3.626***	−2.393***	−3.625***
	(0.4)	(0.2)	(0.36)	(0.24)	(0.36)	(0.24)
Employed	0.971***	0.219	1.061**	0.254*	1.063**	0.254*
	(0.34)	(0.2)	(0.43)	(0.15)	(0.43)	(0.15)
Student	2.073**	3.551***	2.418***	3.230***	2.419***	3.233***
	(0.88)	(0.45)	(0.87)	(0.46)	(0.87)	(0.46)
No. of HH Members	3.019***	−3.396***	2.660***	−3.280***	2.658***	−3.281***
	(0.22)	(0.16)	(0.31)	(0.16)	(0.31)	(0.17)
No. of Children in HH	−4.580***	−0.888***	−4.511***	−0.983***	−4.511***	−0.981***
	(0.27)	(0.15)	(0.24)	(0.12)	(0.24)	(0.12)
$0 < FI < $5000	−14.344***	−4.394***	−14.944***	−4.384***	−14.938***	−4.390***
	(0.85)	(0.61)	(1.02)	(0.51)	(1.02)	(0.51)
$5000 < FI < $7499	−18.013***	−6.131***	−19.046***	−6.414***	−19.049***	−6.418***
	(0.8)	(0.48)	(0.94)	(0.62)	(0.94)	(0.62)
$7500 < FI < $9999	−17.366***	−5.086***	−19.064***	−5.234***	−19.067***	−5.239***
	(0.84)	(0.51)	(1.45)	(0.62)	(1.44)	(0.62)
$10,000 < FI < $12,499	−16.043***	−5.367***	−17.209***	−5.664***	−17.213***	−5.669***
	(0.76)	(0.41)	(1.02)	(0.34)	(1.02)	(0.34)
$12,500 < FI < $14,999	−16.153***	−5.873***	−16.979***	−5.562***	−16.984***	−5.564***
	(0.81)	(0.37)	(1.02)	(0.34)	(1.02)	(0.34)
$15,000 < FI < $19,999	−14.482***	−4.598***	−15.640***	−4.580***	−15.652***	−4.590***
	(0.82)	(0.41)	(0.96)	(0.37)	(0.96)	(0.37)
$20,000 < FI < $24,999	−12.493***	−4.632***	−13.546***	−4.320***	−13.555***	−4.326***
	(0.74)	(0.31)	(1)	(0.28)	(1)	(0.28)
$25,000 < FI < $29,999	−10.871***	−3.583***	−11.732***	−3.658***	−11.739***	−3.662***
	(0.77)	(0.3)	(0.9)	(0.28)	(0.9)	(0.28)
$30,000 < FI < $34,999	−8.195***	−3.062***	−9.140***	−3.161***	−9.141***	−3.165***
	(0.76)	(0.29)	(0.77)	(0.27)	(0.77)	(0.27)
$35,000 < FI < $39,999	−6.303***	−2.760***	−7.359***	−2.833***	−7.360***	−2.835***
	(0.79)	(0.3)	(0.82)	(0.28)	(0.82)	(0.28)
$40,000 < FI < $49,999	−3.784***	−2.347***	−4.532***	−2.430***	−4.535***	−2.434***
	(0.67)	(0.26)	(0.73)	(0.27)	(0.73)	(0.27)
$50,000 < FI < $59,999	0.407	−1.601***	−0.446	−1.501***	−0.442	−1.504***
	(0.77)	(0.31)	(0.86)	(0.28)	(0.86)	(0.28)
$60,000 < FI < $74,999	4.019***	−0.806**	3.596***	−0.974***	3.601***	−0.977***
	(0.88)	(0.29)	(0.66)	(0.27)	(0.66)	(0.27)
$75,000 < FI	24.157***	2.076***	24.782***	2.259***	24.781***	2.254***
	(0.79)	(0.28)	(0.82)	(0.27)	(0.82)	(0.27)
State UE Rate	–	–	−0.383**	−0.05	−1.263***	−0.36
	–	–	(0.19)	(0.11)	(0.35)	(0.28)
Constant	42.967***	47.841***	46.486***	53.340***	50.119***	54.992***
	(0.89)	(0.57)	(1.92)	(0.76)	(3.86)	(1.76)
Observations	246,688	219,499	271,363	240,478	271,363	240,478

Note 1. All specifications include state and year fixed effects and cluster-robust standard errors.
Note 2. UE refers to Unemployment and FI refers to Family Income.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

Table 7-A
Difference in difference estimates on weekly FAFH expenditure and FAFH share – Continuous treatment.

	Baseline		With unemployment	
	FAFH expenditure	FAFH share	FAFH expenditure	FAFH share
Post*SNAP Growth Rate	−0.047	−0.043**	−0.024	−0.040**
	(0.03)	(0.02)	(0.03)	(0.02)
SNAP Growth Rate	0.0003	0.026*	−0.005	0.025*
	(0.03)	(0.01)	(0.03)	(0.01)
Male	4.888***	2.569***	4.896***	2.570***
	(0.25)	(0.09)	(0.25)	(0.09)
Age	−0.157***	−0.112***	−0.157***	−0.112***
	(0.01)	(0.01)	(0.01)	(0.01)
Black	−9.154***	−0.07	−9.153***	−0.07
	(1)	(0.27)	(1)	(0.27)
College	2.770***	0.698***	2.777***	0.698***
	(0.24)	(0.1)	(0.24)	(0.1)
Married	−2.337***	−3.462***	−2.333***	−3.461***
	(0.29)	(0.18)	(0.29)	(0.18)
Employed	1.216***	0.383***	1.206***	0.383***
	(0.28)	(0.13)	(0.28)	(0.13)
Student	2.457***	3.646***	2.464***	3.646***
	(0.57)	(0.34)	(0.57)	(0.34)
No. of HH Members	2.814***	−3.352***	2.818***	−3.352***
	(0.22)	(0.12)	(0.23)	(0.12)
No. of Children in HH	−4.363***	−0.844***	−4.366***	−0.845***
	(0.18)	(0.09)	(0.18)	(0.09)
$0 < Family Income < $5,000	−15.061***	−4.273***	−15.025***	−4.270***
	(0.72)	(0.4)	(0.72)	(0.4)
$5000 < Family Income < $7499	−18.487***	−6.681***	−18.471***	−6.679***
	(0.68)	(0.47)	(0.69)	(0.47)
$7500 < Family Income < $9900	−18.340***	−5.660***	−18.315***	−5.657***
	(0.99)	(0.38)	(0.99)	(0.39)
$10,000 < Family Income < $12,499	−16.706***	−5.388***	−16.676***	−5.385***
	(0.71)	(0.29)	(0.71)	(0.29)
$12,500 < Family Income < $14,999	−16.695***	−5.586***	−16.669***	−5.583***
	(0.71)	(0.27)	(0.71)	(0.27)
$15,000 < Family Income < $19,999	−14.762***	−4.679***	−14.733***	−4.676***
	(0.71)	(0.26)	(0.71)	(0.26)
$20,000 < Family Income < $24,999	−13.147***	−4.456***	−13.116***	−4.453***
	(0.7)	(0.24)	(0.7)	(0.24)
$25,000 < Family Income < $29,999	−11.242***	−3.420***	−11.223***	−3.418***
	(0.66)	(0.21)	(0.66)	(0.21)
$30,000 < Family Income < $34,999	−8.377***	−3.071***	−8.359***	−3.069***
	(0.61)	(0.21)	(0.62)	(0.21)
$35,000 < Family Income < $39,999	−6.622***	−2.699***	−6.609***	−2.697***
	(0.67)	(0.22)	(0.67)	(0.22)
$40,000 < Family Income < $49,999	−3.893***	−2.319***	−3.883***	−2.318***
	(0.59)	(0.18)	(0.59)	(0.18)
$50,000 < Family Income < $59,999	−0.093	−1.544***	−0.091	−1.544***
	(0.65)	(0.21)	(0.65)	(0.21)
$60,000 < Family Income < $74,999	3.981***	−0.908***	3.988***	−0.907***
	(0.6)	(0.21)	(0.6)	(0.21)
$75,000 < Family Income	24.129***	2.073***	24.123***	2.073***
	(0.63)	(0.19)	(0.63)	(0.19)
State Unemployment Rate	–	–	−0.611***	−0.062
	–	–	(0.16)	(0.09)
Constant	40.511***	53.589***	43.882***	53.875***
	(1.28)	(0.41)	(1.55)	(0.6)
Observations	455,641	405,382	455,641	405,382

Note. All specifications include state and year fixed effects and cluster-robust standard errors.
* p < 0.10.
** p < 0.05.
*** p < 0.01.

References

Acemoglu, D., Autor, D.H., Lyle, D., 2004. Women, war, and wages: the effect of female labor supply on the wage structure at midcentury. J. Polit. Econ. 112 (3), 497–551.

Adams, E.J., Grummer-Strawn, L., Chavez, G., 2003. Food insecurity is associated with increased risk of obesity in California women. J. Nutrit. 133 (4), 1070–1074.

Anderson, M.L., Matsa, D.A., 2011. Are restaurants really supersizing America? Am. Econ. J.: Appl. Econ. 152–188.

Autor, D.H., 2003. Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing. J. Labor Econ. 21 (1), 1–42.

Basiotis, P.P., Lino, M., 2003. Food insufficiency and prevalence of overweight among adult women. Family Econ. Nutrit Rev 15 (2), 55.

Baum, C.L., 2011. The effects of food stamps on obesity. South. Econ. J. 77 (3), 623–651.

Beatty, T.K.M., Tuttle, C.J., 2015. Expenditure response to in-kind transfers: evidence from the Supplemental Nutrition Assistance Program. Am. J. Agric. Econ. 97 (2), 390–404.

Binkley, J.K., 2008. Calorie and gram differences between meals at fast food and table

service restaurants. Appl. Econ. Perspect. Policy 30 (4), 750–763.
Boonsaeng, T., Carpio, C. E., Zhen, C., Okrent, A.M., 2012. The effect of Supplemental Nutrition Assistance Program on food spending among low-income households. In: Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington.
Bowman, Shanthy A., Gortmaker, Steven L., Ebbeling, Cara B., Pereira, Mark A., Ludwig, David S., 2004. Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. Pediatrics 113 (1), 112–118.
Breunig, R., Dasgupta, I., 2005. Do intra-household effects generate the food stamp cash-out puzzle? Am. J. Agric. Econ. 87 (3), 552–568.
Browning, M., Collado, M.D., 2007. Habits and heterogeneity in demands: a panel data analysis. J. Appl. Econ. 22 (3), 625–640.
Bruich, G.A., 2014. The Effect of SNAP Benefits on Expenditures: New Evidence from Scanner Data and the November 2013 Benefit Cuts. Harvard University, Mimeograph September.
Burgstahler, R., Gundersen, C., Garasky, S., 2012. The Supplemental Nutrition Assistance Program, financial stress, and childhood obesity. Agricult. Resour. Econ. Rev. 41 (1), 29.
Cai, Y., Alviola, P., Nayga, R.M., Wu, X., 2008. The effect of food-away-from-home and food-at-home expenditures on obesity rates: a state-level analysis. J. Agric. Appl. Econ. 40 (2), 507–521.
Carrasco, R., Labeaga, J.M., David López-Salido, J., 2005. Consumption and habits: evidence from panel data. Econ. J. 115 (500), 144–165.
Centers for Disease Control and Prevention, 2003. Self-reported concern about food security associated with obesity-Washington, 1995-1999. MMWR. Morbidity and mortality weekly report, vol. 52(35), pp. 840.
Chen, Z., Yen, S.T., Eastwood, D.B., 2005. Effects of food stamp participation on body weight and obesity. Am. J. Agric. Econ. 87 (5), 1167–1173.
Cole, N., 1997. Evaluation of the expanded EBT demonstration in Maryland: Patterns of food stamp and cash welfare benefit redemption. Report submitted to the US Department of Agriculture, Food & Consumer Service, Alexandria, VA.
Currie, J., DellaVigna, S., Moretti, E., Pathania, V., 2010. The effect of fast food restaurants on obesity and weight gain. Am. Econ. J.: Econ. Policy 32–63.
Davis, G.C., You, W., 2011. Not enough money or not enough time to satisfy the Thrifty Food Plan? A cost difference approach for estimating a money–time threshold. Food Policy 36 (2), 101–107.
Dietz, W.H., 1995. Does hunger cause obesity? Pediatrics 95 (5), 766–767.
Dinour, L.M., Bergen, D., Yeh, M.C., 2007. The food insecurity–obesity paradox: a review of the literature and the role food stamps may play. J. Am. Diet. Assoc. 107 (11), 1952–1961.
Dunn, R.A., Sharkey, J.R., Horel, S., 2012. The effect of fast-food availability on fast-food consumption and obesity among rural residents: an analysis by race/ethnicity. Econ. Human Biol. 10 (1), 1–13.
Dynan, K.E., 2000. Habit formation in consumer preferences: evidence from panel data. Am. Econ. Rev. 391–406.
Economic Research Service, 2013. Supplemental Nutrition Assistance Program (SNAP) Data System [Data file]. Retrieved on April 19, 2016 from < http://www.ers.usda.gov/data-products/supplemental-nutrition-assistance-program-(snap)-data-system/time-series-data.aspx > .
Fox, M.K., Hamilton, W., Lin, B.H., 2004. Effects of food assistance and nutrition programs on nutrition and health. Food Assistance and Nutrition Research Report (No. 19-3). United States Department of Agriculture, Economic Research Service.
Ganong, P., Liebman, J.B., 2013. The decline, rebound, and further rise in SNAP enrollment: Disentangling business cycle fluctuations and policy changes (No. w19363). National Bureau of Economic Research.
Gibson, D., 2003. Food stamp program participation is positively related to obesity in low income women. J. Nutrit. 133 (7), 2225–2231.
Gregory, C.A., Coleman-Jensen, A., 2013. Do high food prices increase food insecurity in the United States? Appl. Econ. Perspect. Policy 35 (4), 679–707.
Hastings, J.S., Shapiro, J.M., 2017. How Are SNAP Benefits Spent? Evidence from a Retail Panel (No. w23112). National Bureau of Economic Research.
Heien, D., Durham, C., 1991. A test of the habit formation hypothesis using household data. Rev. Econ. Stat. 189–199.
Hoynes, H.W., Schanzenbach, D.W., 2009. Consumption responses to in-kind transfer: evidence from the introduction of the food stamp program. Am. Econ. J.: Appl. Econ. 1 (4), 109–139.
Kaestner, R., Korenman, S., O'Neill, J., 2003. Has welfare reform changed teenage behaviors? J. Policy Anal. Manage. 22 (2), 225–248.
Khare, A., Inman, J.J., 2006. Habitual behavior in American eating patterns: the role of meal occasions. J. Consum. Res. 32 (4), 567–575.
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.
Liu, M., Kasteridis, P., Yen, S.T., 2013. Breakfast, lunch, and dinner expenditures away from home in the United States. Food Policy 38, 156–164.
Lusk, J.L., Weaver, A., 2017. An experiment on cash and in-kind transfers with application to food assistance programs. Food Policy 68, 186–192.
Mancino, L., Todd, J., Lin, B.H., 2009. Separating what we eat from where: measuring the effect of food away from home on diet quality. Food Policy 34 (6), 557–562.
Meyerhoefer, C.D., Pylypchuk, Y., 2008. Does participation in the food stamp program increase the prevalence of obesity and health care spending? Am. J. Agric. Econ. 90 (2), 287–305.
Naik, N.Y., Moore, M.J., 1996. Habit formation and intertemporal substitution in individual food consumption. Rev. Econ. Stat. 321–328.
Olson, C.M., 1999. Nutrition and health outcomes associated with food insecurity and hunger. J. Nutrit. 129 (2), 521S–524S.
Paeratakul, S., Ferdinand, D., Champagne, C., Ryan, D., Bray, G., 2003. Fast food consumption among U.S. adults and children: dietary and nutrient intake profile. J. Am. Diet. Assoc. 103 (10), 1332–1338.
Pan, S., Jensen, H.H., 2008. Does the food stamp program affect food security status and the composition of food expenditures? J. Agric. Appl. Econ. 40 (1), 21–35.
Ratcliffe, C., McKernan, S.M., Zhang, S., 2011. How much does the Supplemental Nutrition Assistance Program reduce food insecurity? Am. J. Agric. Econ. 93 (4), 1082–1098.
Richards, T.J., Patterson, P.M., Tegene, A., 2007. Obesity and nutrient consumption: a rational addiction? Contemp. Econ. Policy 25 (3), 309–324.
Robinson, C.A., Zheng, X., 2011. Household food stamp program participation and childhood obesity. J. Agricult. Resour. Econ. 36 (1), 1.
Thaler, R.H., 1999. Mental accounting matters. J. Behav. Decision Making 12 (3), 183.
Todd, J.E., Mancino, L., Lin, B.H., 2010. The impact of food away from home on adult diet quality. USDA-ERS Economic Research Report Paper, vol. 90.
Todd, J., Morrison, R.M., 2014. Less eating out, improved diets, and more family meals in the wake of the great recession. Amber. Waves 1E.
Townsend, M.S., Peerson, J., Love, B., Achterberg, C., Murphy, S.P., 2001. Food insecurity is positively related to overweight in women. J. Nutrit. 131 (6), 1738–1745.
US Census Bureau, 2015. Mean household income received by each fifth and top 5 percent of households. Current Population Survey, 2015 Annual Social and Economic Supplement [Data file]. Retrieved from < https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html > .
USDA ERS, 2016. Food away from home: Total expenditures [Data file]. Retrieved from < https://www.ers.usda.gov/data-products/food-expenditures.aspx > .
Yen, S.T., Andrews, M., Chen, Z., Eastwood, D.B., 2008. Food stamp program participation and food insecurity: an instrumental variables approach. Am. J. Agric. Econ. 90 (1), 117–132.
You, W., Zhang, G., Davy, B.M., Carlson, A., Lin, B.H., 2009. Food consumed away from home can be a part of a healthy and affordable diet. J. Nutrit. 139 (10), 1994–1999.