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Abstract

Obesity is inordinately prevalent among food insecure households in the US. Some researchers have identified the consumption of unhealthy food a major source of this seemingly paradoxical relationship. One of the goals of the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program, is to encourage healthy eating behavior among low-income households. However, literature lacks conclusive evidence for the success of the program in achieving that goal. This paper exploits an underutilized source of variation, the early-2000s recession in the US, to determine the impact of SNAP participation on household Food Away From Home (FAFH) expenditures. A Difference in Difference model is constructed using high post-recession growth in SNAP caseloads as treatment. The results show that households in the treatment cohort significantly decrease consumption of FAFH relative to households in the control group. This provides evidence that SNAP participation leads households to make healthier eating choices.

Keywords: SNAP, FAFH, obesity, food insecurity, low income, recession

JEL Codes: D12, H31, H75, Q18

I. Introduction

Supplemental Nutrition Assistance Program (SNAP) is a federal nutrition-assistance program that is regulated by the Food and Nutrition Service (FNS) of the USDA and provides welfare benefits to numerous households throughout the United States. While the program has been touted for successfully targeting food insecurity in the US, it has also been criticized for having the unintended consequence of promoting obesity in low income households. 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 the nutrition needs of their members should exhibit starvation. However, in practice food insecurity has been shown to be positively correlated with overweight and obesity, especially among women (Basiotis and Lino, 2003; Townsend *et al.*, 2001; Olson, 1999; Adams *et al.*, 2003; Centers for Disease Control and Prevention, 2003; Dinour *et al.*, 2007). In particular, individuals in food insecure households who also participate in SNAP have a greater likelihood of obesity (Meyerhoefer and Pylypchuk, 2008; Townsend *et al.*, 2001; Robinson and Zheng, 2011; Baum, 2011; Gibson, 2003; Chen *et al.*, 2005).

Economists have offered two major explanations for the role of SNAP in promoting obesity among food insecure households. First, obesity among SNAP beneficiaries might be attributed to the Food Acquisition Cycle (Wilde and Ranney, 2000). The monthly income shock from benefit receipt might cause severely food insecure to engage in binge-eating behavior and exhaust funds earmarked for food consumption well before the receipt of next month's benefits. This spell is followed by a period of hunger during which households cut back on food consumption to make funds last until the end of the cycle. This feast and famine cycle is hypothesized by researchers to cause obesity.

The second factor offered as explanation of SNAP's role in obesity is that participation may lead households to increase expenditure on Food Away From Home (FAFH) (Fox *et al.*, 2004). However, there is some debate among researchers whether FAFH leads to obesity. Literature has shown that FAFH tends to be more energy dense (Binkley, 2008) and less healthy than Food At Home (FAH) (Mancino *et al.*, 2009). In particular, Currie *et al.* (2010) show that proximity to a fast food restaurant increases the likelihood of obesity among children and pregnant women significantly. On the other hand, Anderson and Matsa (2011) determine that there is no causal link between food consumption at restaurants and obesity. Other researchers have focused on the direct relationship between FAFH consumption and diet quality. Bowman *et al.* (2004), Paeratakul *et al.* (2003), Binkley (2008), 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.

While SNAP benefits are restricted to be spent on FAH only, households that spend more on food than the amount of SNAP benefits they receive can substitute current cash expenditure on food for SNAP dollars. These households are termed 'inframarginal' and the fungibility of SNAP benefits with cash allows them to utilize benefits for purchases of SNAP-ineligible items. While this effect has been repeatedly theorized by researchers, there is sparse empirical evidence to determine the true effect of SNAP on FAFH expenditure. Among a handful of studies, Hoynes and Schanzenbach (2009) employ program introduction as source of variation and find a negative but insignificant association between SNAP and FAFH expenditure. Beatty and Tuttle (2015) use increases in SNAP benefits due to the American Recovery and Reinvestment Act (ARRA) as a natural experiment and also find a negative but statistically insignificant relationship between SNAP benefits and FAFH expenditure.

The focus of this study is the second source of obesity outlined above. In particular, I provide a test of whether SNAP participation leads to changes in FAFH expenditure and FAFH as a share of total food expenditure. The early-2000s recession was followed by sudden spikes in SNAP caseloads across the country. However, there is tremendous state-level variation in the impact of the recession and in the willingness of states to expand eligibility, leading to significant differences in the rate and magnitude of the increase in SNAP participation. I exploit this variation to compare changes in household FAFH expenditures in states that experienced large spikes in SNAP participation to states in which the participation increases were milder. The Difference in Difference (DID) model utilized in this study defines treatment as high growth in SNAP caseloads. Consequently, the treatment group is comprised of 15 states with highest rate of growth in post-recession SNAP participation and the control group as comprised of 15 states with the lowest rate of growth in post-recession SNAP participation. Results show participation leads to a modest but statistically significant decrease in FAFH expenditure in the high growth cohort relative to the low growth cohort. In addition, participation has a significant negative effect on FAFH as a share of total food expenditure which indicates that participants substitute FAFH for FAH. As expected, the effect is stronger for households that have greater exposure to treatment, that is, a higher likelihood of participating in SNAP as a result of the recession.

This paper is organized in the following way. Section II provides a background of SNAP and the early 2000s recession in the contextual framework of DID estimation. Section III gives an overview of data above along with a discussion of summary statistics. Section IV presents descriptive evidence for the effect of SNAP participation on FAFH. Section V explains the research design and methodology employed in the construction of the empirical model. Section

VI presents results of the DID estimation. Section VII includes a discussion of policy implications and section VII concludes.

II. Background

In the past decade or so, SNAP participation has gone through a series of drastic changes. For the better part of the 1990s SNAP caseloads steadily declined nationwide, especially following the welfare reform of 1996 called the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). 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) which consequently redefined categorical eligibility (Laird and Trippe, 2014). 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 $8,595 in 1996 to $10,157 in the year 2000 (US Census Bureau, 2015). Following this period of contraction, SNAP caseloads sharply rebounded as the economy entered the early 2000s recession. Figure 1 shows the trend in national average SNAP participation rates from 1989 to 2012. Of particular note is the trend reversal in the year 2000 at which point participation rates started to rise across the country.

This sudden spike in SNAP caseloads in response to the recession can be explained by two major factors: decline in income of poor households (from $10,157 mean income in the year 2000 to $9,996 in 2003 (US Census Bureau, 2015)) and relaxation of SNAP eligibility requirements at the state level (such as the elimination of the asset test, introduction of Broad Based Categorical Eligibility (BBCE), and simplified reporting). There is substantial state-level variation in the impact of these two effects on SNAP participation. Participation growth rates between the year 2000 and 2011 ranged from a maximum of about 17% in Nevada to a minimum

of 4% in Hawaii. This variation is even greater between the years 2000 and 2003, the period immediately following the start of the recession, with growth rates ranging from 23.5% in Arizona to -4.4% in Hawaii (Economic Research Service, 2013). Shortly after the sudden increase, participation growth 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 has subsided in recent years as the economy recuperates.

III. Data

A household-level sample is generated from the 1999 to 2011 cycles of the Current Population Survey Food Security Supplement (CPS-FSS). The CPS is a large and nationally representative survey of the civilian non-institutionalized 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 each year and is conducted to elicit household-level information on issues regarding food security, food expenditure, food consumption patterns, program participation, etc. The CPS-FSS provides data on all variables needed to construct the model developed in this study including self-reported weekly expenditure on FAFH and FAH and geographic identifiers at the state level. The CPS-FSS represents households in all 50 states and District of Colombia.

Table 1 shows a snapshot of the sample generated from CPS-FSS. About 16% of the households in the sample participate in SNAP during the 15 year period considered. Mean food away from home expenditure is just under $45 per week. Observations in the period following the start of the recession comprise about 73% of the total sample and households in the high growth cohort make up 69% of all households. Note that the sample is comprised only of households in the high growth and low growth cohorts which jointly represent a total of 30

states. The rest of the variables in Table 1 show demographic characteristics of the representative household in the sample. 54% of households have a male household head and the mean head is just under 50 years of age. About 10% of the entire sample has household heads that identify their race as black, 26% are at least college educated, 52% of household heads are married, 63% are employed (either part time or full time), and 2% are enrolled in some education program. The average number of members per household is 2.48 while the average number of children per household is 0.63. Finally, approximately 30% of all households in the sample report family income to be less than $15,000 per year.

IV. Descriptive Analysis

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, if households that choose to participate in SNAP vary significantly in terms of their FAFH expenditure from households that do not participate, the estimates of an OLS regression will be biased and cannot be used to make causal inference. This may be due to household preferences which are commonly either unobserved or difficult to measure. I use a novel research design to overcome this issue by exploiting the recession of 2001 in the US as a natural experiment to identify a Difference in Difference (DID) model.

The economic slump at the turn of the century led to a rise in SNAP caseloads in all states in the country, essentially reversing the downward trend of the mid to late nineties. There is considerable variation, however, in how participation changed between states after the occurrence of the recession. Some states experienced a sharp rise in SNAP participation rates while others saw a gradual increase or even a decrease.

Treatment and control groups

Based on state-level participation growth rates, a treatment and a control group is constructed. The treatment group, also known as the high growth cohort, includes 15 states that experienced the highest growth rates in SNAP participation from the years 2000 to 2011. The control group, also 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 the list of states included in each of the cohorts. It follows that households residing in the high growth states have the highest probability of participating in SNAP after the start of the recession and households in the low growth states have the lowest probability of participation. Using the early 2000s recession as a natural experiment, the estimates of the DID model can be obtained by comparing the change in FAFH expenditure of households in treatment states with that of households in control states.

Unbiased estimation of the DID model is contingent on the validity of the parallel trends assumption. That is, the change in FAFH expenditure of households in the low growth cohort represents the counterfactual outcome of households in the high growth states. The validity of the parallel trends assumption is evident if the divergence in FAFH expenditures between the treatment and control groups coincides with the divergence in SNAP participation growth over the same period. Figure 2 shows the average percentage change in the level of total SNAP participation indexed to the year 2000 for the 15 states in the high growth cohort and for 15 states in the low growth cohort. As is clear from the graph, changes in total SNAP participation in each cohort prior to the year 2000 are largely similar. 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 state-level participation growth.

Similarly, Figure 3 shows annual aggregate FAFH expenditure in each cohort using data from the CPS-FSS. Until the early 2000s, FAFH expenditure is relatively similar in both cohorts. However, after the year 2002 there is an unambiguous divergence between the treatment and control group, with FAFH expenditure increasing sharply in both cohorts but to a smaller extent in the high growth cohort. Given that the FAFH expenditure of the low growth cohort represents the counterfactual outcome for the high growth cohort in the DID framework, Figure 2 and 3 provide evidence that SNAP is the main cause behind the muted increase in FAFH expenditure of the high growth cohort.

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. The delayed response in 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 participating in SNAP. This effect is discussed in greater detail in the sections below.

The effect of the recession

The early-2000s recession led to changes in SNAP participation through two major channels: changes in household income and changes in state-level eligibility criteria. The heterogeneous effect of the recession on state-level SNAP participation can be explained by the differing magnitude of these two effects. First, household incomes declined and subsequently poverty rates spiked at a much faster rate in the high growth cohort relative to the low growth cohort.

Figure 4 shows average state-level poverty rates for each cohort indexed to the year 2001. The graph shows that after the beginning of the early-2000s recession the poverty rate in the high growth cohort sharply increased while the low growth cohort experienced a milder increase relative to the base year and relative to the counterpart cohort. This is consistent with the idea that the post-recession increase in SNAP caseloads is partly explained by individuals falling below the poverty threshold and qualifying for SNAP under the stricter pre-recession eligibility requirements.

Second, in response to the recession states in the high growth cohort were quicker to implement policies that relaxed the eligibility criteria for participation relative to their low growth counterparts. This is apparent for a number of state-level options. Broad Based Categorical Eligibility (BBCE) is a policy which eases eligibility by allowing participants of other welfare programs such as Temporary Assistance for Needy Families (TANF) or Supplemental Security Income (SSI) to automatically qualify for SNAP benefits. Figure 5 shows the cumulative number of states in each cohort that had adopted BBCE in each year since 2000. It is obvious from the figure that states in the high growth cohort adopted BBCE sooner than states in the low growth cohort. In fact, most of the states in the low growth cohort adopted the policy as a result of the Great Recession of 2008. On the other hand, several high growth states adopted BBCE in the earlier part of the decade well before the 2008 recession. Similarly, Figure 6 shows changes in the percentage of households in each cohort that are required to seek recertification within a 1 to 3 month period as opposed to longer time intervals. Recertification imposes a transaction cost and makes it easier for a household to become ineligible. As shown in Figure 6, the proportion of households with short recertification periods declines sharply following the start of the early-2000s recession. However, the drop in high growth states is

clearly more substantial than their low growth counterparts. Not long after the beginning of the descent does the proportion of short recertification households in the high growth cohort fall below those in the low growth cohort.

The two cohorts exhibited similar patterns as it relates to other SNAP policies as well. In general, states mostly relied on direct policy changes and administrative options to alter eligibility requirements. For example, high growth states more readily adopted simplified reporting, which eliminates the requirement that participants must report any changes in income and living conditions regularly. Other changes include using telephone interviews instead of in-person interviews at recertification without documenting household hardship and accepting online SNAP applications. These policies reduce the transaction cost of participation for the household. High growth states consistently show greater effort to ease eligibility using either streamlined administration or direct policy interventions relative to low growth states. Therefore, the variation in SNAP participation growth between the two cohorts can be largely explained by changes in the eligibility criteria in the wake of the early-2000s recession.

V. Research Design and Methodology

To determine the impact of SNAP participation on FAFH expenditure, I construct a DID model exploiting state-level variation arising from the early-2000s recession. 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. Even though the two cohorts can differ, observable variation is captured by the inclusion of household-level covariates and unobservable differences are accounted for using state and time fixed effects.

This research design circumvents the most substantial issue that researchers encounter when studying the implications of SNAP. Participation in the program is generally believed to be endogenous to outcome variables, such as total food expenditure, obesity, type of food purchased, etc. Many approaches have been taken to tackle the selection issue including the use of various instrumental variables for participation such as county participation rate (Burgstahler et al., 2012), state-level SNAP eligibility rules (Boonsaeng et al., 2012; Ratcliffe et al., 2011; Gregory and Coleman-Jensen, 2013), and percentage of EBT benefits (Yen et al., 2008). However, there is some debate on whether instrumental variables completely satisfy the exclusion restriction assumption. Other researchers have relied on DID approaches, using natural experiments such as the county-level introduction of SNAP (Hoynes and Schanzenbach, 2009), the instatement of American Recovery and Reinvestment Act (ARRA) of 2009 (Beatty and Tuttle, 2015) which temporarily increased benefit disbursement, and the subsequent elimination of ARRA in 2013 (Bruich, 2014). In general, DID models provide cleaner identification relative to the use of instrumental variables as long as the exogeneity of the natural experiment is established.

I follow in the footsteps of the latter group of researchers by using an underutilized source of variation, the early-2000s recession, to identify the impact of SNAP participation on FAFH expenditure. The DID model is given by the following equation:

$$FAFH_{ist} = \tau D_t * Highgrowth_s + \rho X_i + \theta_s + \delta_t + \varepsilon_{ist}$$

where $FAFH_{ist}$ measures weekly FAFH expenditure in dollars and FAFH as a share of total expenditure on food for household i residing in state s in year t. The model is estimated separately for each outcome variable. The variable of interest is the interaction between the

intervention dummy D_t, which marks the beginning of the early-2000s recession and equals 1 if the household is observed after the start of the year 2001, and the treatment group dummy $Highgrowth_s$, which equals 1 if the household resides in a state in the high growth cohort. The interaction term $D_t * Highgrowth_s$ 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 expenditure. The coefficient τ can be interpreted as the average dollar change in FAFH expenditures of treatment households relative to control households. This coefficient is expected to have a negative sign, implying that SNAP participation decreases FAFH expenditure and consequently the FAFH restriction on SNAP benefits is effective. In other words, a dollar of cash is not equal to a dollar of SNAP benefits.

The vector X_i contains household-level covariates such as income, age of the household head, number of children in the household, etc., θ_s and δ_t capture state and year level fixed effects respectively, and ε_{ist} is the error term. The inclusion of state and year fixed effects is important as they remove any unobservable variation through which the early-2000s recession might influence FAFH expenditure independent of its effect through SNAP participation. In the absence of these controls, unaccounted for differences between the high growth and low growth cohort might bias estimates of the DID model.

In addition to estimation of the baseline model using the full sample of 15 states in each cohort, a series of sensitivity tests are conducted by restricting the sample to households that have a high likelihood of participating in the program 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, essentially increasing the exposure to treatment for the high growth cohort and reducing exposure to treatment for the low growth cohort. Consequently, the

average household in the high (low) growth cohort of 10 states has a higher (lower) likelihood of participation after the start of the early-2000s 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 lower than $25,000. The federal SNAP eligibility criteria specifies a gross income limit of 130% of Federal Poverty Guidelines with exceptions made 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 those which satisfied the eligibility criteria and were likely already participating before the occurrence of the recession. The intervention is unlikely to change the participation status of households in this group and their inclusion in the sample will attenuate the impact of participation on FAFH expenditure to zero. 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 therefore have a higher probability of participating in response to the recession. It will also include households who may have been eligible before the occurrence of the recession but did not participate. In addition to the sensitivity tests, I estimate a DID model to elicit the immediate effect of SNAP participation by limiting the sample to only the years 1999 to 2002. This specification captures the effect of participation on FAFH within a year of exposure to the treatment and will determine the short-term impact of participation on FAFH.

The effect of income

The identification strategy relies on the assumption that apart from the deviating impact on SNAP participation, there are no other factors through which the recession differentially impacted household FAFH consumption. In other words, there are no unaccounted-for variables

that confound the impact of SNAP participation on FAFH expenditure and therefore FAFH expenditure is unrelated to the recession except through changes in SNAP participation. One such confounding variable that may undermine this assumption is income. During a recession, declining income may cause households to divert their spending from FAFH which is generally 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, the estimates of the DID model will be biased upwards. To parse out this confounding effect, I include household-level income measures as covariates and rely solely on the second source of variation (state policy changes) to identify the model. The CPS-FSS provides a categorical measure of income with relatively narrow income brackets, especially for low-income households. Binary variables for each income category are included in the empirical model to capture time variant income effects for households in the two cohorts. In addition, baseline income differences between the high growth and low growth cohorts are controlled for by the treatment dummy. As a result, the effect of income is essentially removed from the model and the main source of identification is variation arising from changes in state-level eligibility criteria.

VI. Results

Table 3 and Table 4 show results from different specifications of the DID model. All specifications include state and year fixed effects and standard errors are multi-way clustered by state and year. The full set of results for the specifications in Table 3 and Table 4 are provided in Table 5 and Table 6 respectively. The specifications in Table 3 posit FAFH as a share of total food expenditure as the dependent variable and are estimated for a sample of 240,478 households

observed over the years 1999 to 2011. Column I presents the results of a parsimonious DID model with the variable of interest, $D_t * Highgrowth_s$, as the only independent variable in addition to state and year fixed effects. The coefficient shows that SNAP participation induces households to decrease FAFH's share of total food expenditure by 0.825% and the estimate is significant at the 10% confidence level. In column II, household level covariates are added to the specification in column I. The magnitude of the effect is slightly smaller and has the same level of significance. This shows that household demographics introduce noise to the effect of SNAP on FAFH. Column III shows results from controlling for annual household income in addition to household covariates. As expected, the magnitude of the coefficient is smaller than previous specifications. Participation in SNAP leads households to reduce FAFH share of total expenditure by about 0.774%. This provides evidence that the effect of income imposes an upward bias on the estimates and controlling for this confounding effect attenuates the coefficient towards zero.

Table 4 presents results for additional specifications discussed in the previous section. Column I specifies total weekly FAFH expenditure as the outcome variable and is estimated for a sample of 271,363 households generated over the period 1996 to 2011. This specification allows for a larger sample due to additional data available for the years 1996 to 1998. The results show that SNAP participation results in an approximate $1.50 decrease in weekly FAFH expenditure. Columns II through V specify FAFH's share of total food expenditure as the outcome variable. Column I is identical to column III of Table 3 and is juxtaposed with other specifications in this table for comparison. Column III presents results from the sample that redefines high growth and low growth cohorts to include 10 states each. The effect is of a substantially higher magnitude and is significant at the 1% confidence level. Participation in

SNAP causes a 1.2% reduction in FAFH's share of total food expenditure. This provides evidence of a dose-response effect because when the exposure to treatment is amplified, households exhibit a stronger 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 0.8% decrease in FAFH as share of total food expenditure and is significant at the 1% confidence level. Results from columns III and IV lend support to the validity of the model because households with a greater likelihood of treatment exhibit a stronger impact of SNAP participation on FAFH. Finally, column IV presents results from the model which restricts the sample to the years 1999 to 2002. The immediate effect of participation is approximately 0.83% decrease in the outcome variable and the coefficient is significant at the 5% confidence level.

VII. Discussion

According to economic theory, for inframarginal households in-kind benefits are similar to an equivalent cash transfer. Consequently, inframarginal 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 shock might cause households to spend more on meals out. This is evident in the results obtained by Hoynes and Schanzenbach (2009) who show that the marginal propensity to consume food out of SNAP benefits is close to the marginal propensity to consume food out of cash income.

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. In other words, SNAP participation causes households to reallocate food expenditure away from FAFH and towards FAH. As a consequence, even though households are generally considered

inframarginal (and therefore SNAP benefits are fungible with cash) the restriction on using SNAP benefits for FAFH expenditure out of SNAP benefits is effective in altering behavior for most participants. A possible explanation for the deviation from the predictions of canonical economic theory is that households might fail to assess the fungibility of SNAP benefits with cash. In this case, the "power of suggestion" of the program design might induce tangible changes in household consumption behavior. Another explanation might be that the fungibility of benefits has been overstated in literature. Households might not be as inframarginal as previously shown and therefore participation may significantly distort utility-maximizing consumption. A third possible explanation is that even though inframarginal households do not increase their total expenditure on food when they receive benefits, SNAP might cause them to change the mix of FAH and FAFH in their total food consumption.

The policy implication of this result is straightforward. SNAP is an important tool in the battle against obesity among low income households. It has been largely successful in inducing households to allocate a greater proportion of their food expenditure on FAH relative to FAFH and therefore has the potential to encourage food insecure households to make healthier eating choices. Even though research has shown that households exhibit intertemporal dependence in food consumption, the effect of participation on FAFH is still significantly negative. As a result, the program is one that policymakers can readily rely on to achieve desirable health outcomes in addition to providing a safety net against food insecurity. Furthermore, state level policy interventions to expand the program at the turn of the new millennium proved highly beneficial and may have been responsible for tempering the prevalence of obesity among low income households in subsequent years. Not only did the expansion reduce household FAFH expenditures immediately following the early-2000s recession, but the effect was sustained over

the following decade. Given the counterfactual outcome in the DID model, in the absence of program expansion the food insecurity-obesity paradox might have been exacerbated.

VIII. Conclusion

This study provides a direct test for the relationship between SNAP participation and household FAFH expenditure. I exploit an underutilized source of variation in state-level SNAP caseloads, the early-2000s recession, as a natural experiment to identify a simple Difference in Difference model. Treatment is defined as the probability of a household participating in SNAP and is based on the state's participation growth in the years following the early-2000s recession. The treatment group consists of households that reside in any of the 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. Variation used to identify the Difference in Difference model arises from state-level policy changes directed at relaxing the eligibility criteria and easing the administrative burden of participation on households. The results show that following the early-2000s recession households in the high growth cohort significantly reduced FAFH consumption relative to their low growth counterparts. In addition, households in the high growth cohort also exhibited a decline in FAFH as a share of total food expenditure, indicating a reallocation of food expense towards FAH. 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 sensitivity tests which lend validity to the Difference in Difference research design. It follows that SNAP has been successful at encouraging households to develop better eating habits by diverting expenditures away from FAFH and towards FAH and therefore SNAP is an effective policy tool in combating obesity among food insecure households.

References

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

Anderson, M. L., & Matsa, D. A. (2011). Are restaurants really supersizing America? *American Economic Journal: Applied Economics*, 152-188.

Autor, D. H. (2003). Outsourcing at will: The contribution of unjust dismissal doctrine to the growth of employment outsourcing. *Journal of labor economics*, *21*(1), 1-42.

Basiotis, P. P., & Lino, M. (2003). Food insufficiency and prevalence of overweight among adult women. *Family Economics and Nutrition Review*,*15*(2), 55.

Baum, C. L. (2011). The Effects of Food Stamps on Obesity. *Southern Economic Journal*, *77*(3), 623-651.

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

Binkley, J. K. (2008). Calorie and Gram Differences between Meals at Fast Food and Table Service Restaurants. *Applied Economic Perspectives and 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., Steven L. Gortmaker, Cara B. Ebbeling, Mark A. Pereira, and David S. Ludwig. "Effects of Fast-Food Consumption on Energy Intake and Diet Quality Among Children in a National Household Survey," Pediatrics 113(1): p. 112-18, 2004.

Browning, M., & Collado, M. D. (2007). Habits and heterogeneity in demands: a panel data analysis. *Journal of Applied Econometrics*, *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. *Agricultural and Resource Economics Review*, *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. *Journal of Agricultural and Applied Economics*, *40*(2), 507-521.

Carrasco, R., Labeaga, J. M., & David López-Salido, J. (2005). Consumption and Habits: Evidence from Panel Data*. *The Economic Journal*, *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*, *52*(35), 840.

Chen, Z., Yen, S. T., & Eastwood, D. B. (2005). Effects of food stamp participation on body weight and obesity. *American Journal of Agricultural Economics*, *87*(5), 1167-1173.

Currie, J., DellaVigna, S., Moretti, E., & Pathania, V. (2010). The effect of fast food restaurants on obesity and weight gain. *American Economic Journal: Economic Policy*, 32-63.

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. *Journal of the American Dietetic Association*, *107*(11), 1952-1961.

Dynan, K. E. (2000). Habit formation in consumer preferences: Evidence from panel data. *American Economic Review*, 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.

Frongillo, E. A., Jr., Olson, C. M., Rauschenbach, B. S. & Kendall, A. (1997). Nutritional Consequences of Food Insecurity in a Rural New York State County. Discussion Paper no. 1120–97. Institute for Research on Poverty, University of Wisconsin, Madison, WI.

Gibson, D. (2003). Food stamp program participation is positively related to obesity in low income women. *The Journal of nutrition*, *133*(7), 2225-2231.

Gregory, C. A., & Coleman-Jensen, A. (2013). Do high food prices increase food insecurity in the United States?. *Applied Economic Perspectives and Policy*, *35*(4), 679-707.

Heien, D., & Durham, C. (1991). A test of the habit formation hypothesis using household data. *The Review of Economics and Statistics*, 189-199.

Hoynes, H. W., and Schanzenbach, D. W. (2009). Consumption Responses to In-Kind Transfer: Evidence from the Introduction of the Food Stamp Program. *American Economic Journal: Applied Economics*, *1*(4), 109-139.

Khare, A., & Inman, J. J. (2006). Habitual behavior in American eating patterns: The role of meal occasions. *Journal of Consumer Research*, *32*(4), 567-575.

Laird, E., & Trippe, C. (2014). Programs Conferring Categorical Eligibility for SNAP: State Policies and the Number and Characteristics of Households Affected. *Submitted to the US Department of Agriculture, Food and Nutrition Service. Washington, DC: Mathematica Policy Research*.

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? *American Journal of Agricultural Economics*, *90*(2), 287-305.

Naik, N. Y., & Moore, M. J. (1996). Habit formation and intertemporal substitution in individual food consumption. *The Review of Economics and Statistics*, 321-328.

Olson, C. M. (1999). Nutrition and health outcomes associated with food insecurity and hunger. *The Journal of nutrition*, *129*(2), 521S-524S.

Paeratakul, S., D. Ferdinand, C. Champagne, D. Ryan, and G. Bray. "Fast food consumption among U.S. adults and children: Dietary and nutrient intake profile," Journal of the American Dietetic Association 103(10): p. 1332-38, 2003

Ratcliffe, C., McKernan, S. M., & Zhang, S. (2011). How much does the Supplemental Nutrition Assistance Program reduce food insecurity? *American Journal of Agricultural Economics*, *93*(4): 1082–1098.

Richards, T. J., Patterson, P. M., & Tegene, A. (2007). Obesity and nutrient consumption: a rational addiction?. *Contemporary Economic Policy*, *25*(3), 309-324.

Robinson, C. A., & Zheng, X. (2011). Household Food Stamp Program Participation and Childhood Obesity. *Journal of Agricultural and Resource Economics*, *36*(1), 1.

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*, (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. *The Journal of Nutrition*, *131*(6), 1738-1745.

US Census Bureau. (2015). *Current Population Survey, 2015 Annual Social and Economic Supplement* [Data file]. Retrieved from ftp://ftp2.census.gov/programs-surveys/cps/techdocs/cpsmar15.pdf.

Wilde, P. E., & Ranney, C. K. (2000). The Monthly Food Stamp Cycle: Shopping Frequency and Food Intake Decisions in an Endogenous Switching Regression Framework. *American Journal of Agricultural Economics*, *82*(1), 200-213.

Yen, S. T., Andrews, M., Chen, Z., & Eastwood, D. B. (2008). Food Stamp Program participation and food insecurity: an instrumental variables approach. *American Journal of Agricultural Economics*, *90*(1), 117-132.

Appendix

Table 1. CPS Food Security Supplement Descriptive Statistics by Cohort

Variable	Treatment	Control
SNAP (%)	14.3	17
FAFH ($)	45.7	46.7
FAFH Share (%)	35	35.6
Post-recession (2001) (%)	73.9	71.3
Male (%)	53.8	53.6
Age	49.5	49.6
Black (%)	10	11
College (%)	27.6	26
Married (%)	52.4	50
Employed (%)	64.3	62.7
Student (%)	1.5	1.6
Number of HH members	2.5	2.5
Number of children	0.6	0.7
Family Income < $15K (%)	33	37.3

Table 2. Average Growth in SNAP Participation Rate by Cohort between 2000 to 2011

High Growth Cohort		Low Growth Cohort	
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%

Table 3. OLS Regression on Weekly FAFH Share of Total Food

	(I)	(II)	(III)
D*HighGrowth	-0.825*	-0.811*	-0.744*
	(0.5)	(0.42)	(0.4)
HH Demographics	No	Yes	Yes
HH Income	No	No	Yes
Observations	240,478	240,478	240,478

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

Note 1. All specifications include state and year fixed effects

Note 2. Standard errors for all specifications are multi-way clustered by state and year

Note 3. Income measures include binary variables for each category. Demographics are given in Table 1.

Table 4. OLS Regression on Weekly FAFH Expenditure and FAFH Share

	I	II	III	IV	V
	FAFH Expense	**FAFH Share**			
	Full Sample	Full Sample	20 States	Income>$25K	Immediate effect
D*High Growth	-1.473*	-0.774*	-1.182***	-0.807***	-0.825**
	(0.87)	(0.4)	(0.45)	(0.2)	(0.36)
HH Demographics	Yes	Yes	Yes	Yes	Yes
HH Income	Yes	Yes	Yes	Yes	Yes
Observations	271,363	240,478	126,263	175,078	85,481

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

Note 1. All specifications include state and year fixed effects

Note 2. Standard errors for all specifications are multi-way clustered by state and year

Note 3. Income measures include binary variables for each category. Demographics are given in Table 1.

Table 5. OLS Regression on Weekly FAFH Share of Total Food (Full Table)			
	I	**II**	**III**
D *High Growth	-0.825*	-0.811*	-0.774*
Male	-	2.691***	2.569***
Age	-	-0.104***	-0.116***
Black	-	-0.705	-0.042
College	-	1.312***	0.512***
Married	-	-2.144***	-3.626***
Employed	-	1.540***	0.254
Student	-	2.216***	3.229***
No. of HH Members	-	-2.897***	-3.280***
No. of Children in HH	-	-1.385***	-0.982***
$0<Family Income <$5,000	-	-	-4.386***
$5,000<Family Income<$7,499	-	-	-6.416***
$7,500<Family Income<$9,900	-	-	-5.236***
$10,000<Family Income<$12,499	-	-	-5.668***
$12,500<Family Income<$14,999	-	-	-5.565***
$15,000<Family Income<$19,999	-	-	-4.583***
$20,000<Family Income<$24,999	-	-	-4.323***
$25,000<Family Income<$29,999	-	-	-3.659***
$30,000<Family Income<$34,999	-	-	-3.162***
$35,000<Family Income<$39,999	-	-	-2.833***
$40,000<Family Income<$49,999	-	-	-2.431***
$50,000<Family Income<$59,999	-	-	-1.501***
$60,000<Family Income<$74,999	-	-	-0.974**
$75,000<Family Income	-	-	2.260***
Constant	36.313***	47.921***	53.145***
Observations	240478	240478	240478

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

Note 1. All specifications include state and year fixed effects

Note 2. Standard errors for all specifications are multi-way clustered by state and year

Table 6. OLS Regression on Weekly FAFH Expenditure and FAFH Share (Full Table)

	I	II	III	IV	V
	FAFH Expense	**FAFH Share**			
	Full Sample	Full Sample	20 States	Income> $25K	Immediate effect
D*High Growth	-1.473*	-0.774*	-1.182***	-0.807***	-0.825**
Male	5.176***	2.568***	2.515***	2.093***	2.563***
Age	-0.164***	-0.115***	-0.113***	-0.117***	-0.118***
Black	0.459	-0.841***	-0.348	-0.072	-0.953**
College	2.842***	0.511***	0.439**	0.488**	1.086***
Married	-1.814***	-3.603***	-3.292***	-3.947***	-3.881***
Employed	1.003*	0.259	0.069	-0.137	0.291
Student	2.964**	3.237***	3.917***	0.401	3.720***
No. of HH Members	2.545***	-3.292***	-3.301***	-3.330***	-3.419***
No. of Children in HH	-4.582***	-0.975***	-0.910***	-0.760***	-0.976***
$0<Family Income <$5,000	-16.029***	-4.418***	-4.645***	0	-3.871***
$5,000<Family Income<$7,499	-20.094***	-6.433***	-6.763***	0	-7.829***
$7,500<Family Income<$9,900	-19.673***	-5.258***	-4.576***	0	-6.476***
$10,000<Family Income<$12,499	-17.624***	-5.683***	-5.378***	0	-5.437***
$12,500<Family Income<$14,999	-17.273***	-5.568***	-6.080***	0	-4.886***
$15,000<Family Income<$19,999	-15.893***	-4.588***	-4.562***	0	-4.284***
$20,000<Family Income<$24,999	-13.703***	-4.324***	-4.081***	0	-4.330***
$25,000<Family Income<$29,999	-11.870***	-3.654***	-3.748***	0	-2.613***
$30,000<Family Income<$34,999	-9.192***	-3.160***	-2.794***	0.546*	-2.657***
$35,000<Family Income<$39,999	-7.389***	-2.826***	-2.419***	0.899***	-1.819***
$40,000<Family Income<$49,999	-4.470***	-2.423***	-2.426***	1.329***	-1.722***
$50,000<Family Income<$59,999	-0.298	-1.489***	-1.257***	2.314***	-1.230***
$60,000<Family Income<$74,999	3.782***	-0.962**	-0.755	2.885***	-0.068
$75,000<Family Income	25.165***	2.280***	2.234***	6.187***	3.092***
Constant	36.560***	50.440***	52.630***	49.888***	53.300***
Observations	271,363	240,478	126,263	175,078	85,481

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

Note 1. All specifications include state and year fixed effects

Note 2. Standard errors for all specifications are multi-way clustered by state and year

Figure 1: National Average SNAP Caseloads

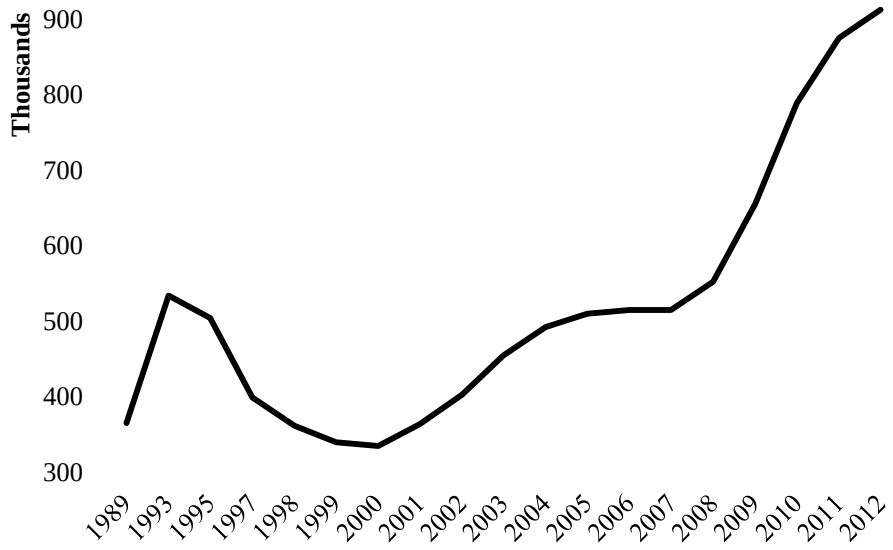

Figure 2: Changes in SNAP Participation in High Growth and Low Growth Cohorts: Index=2000

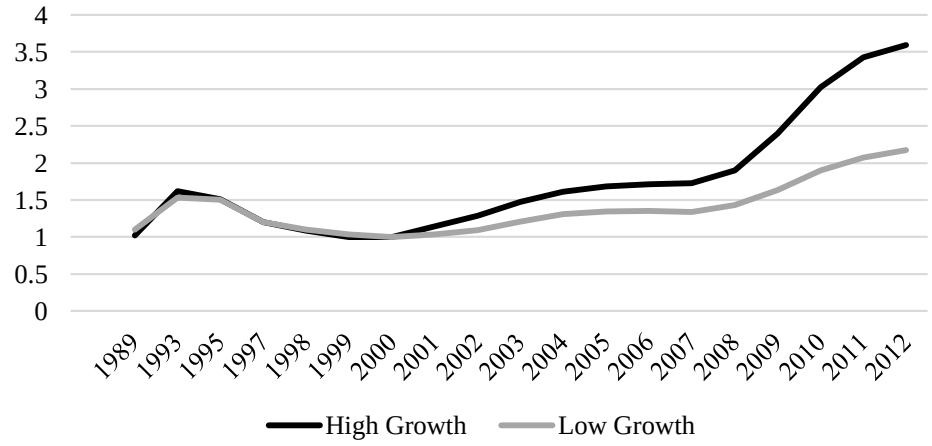

Figure 3: Annual Aggregate FAFH Expenditure

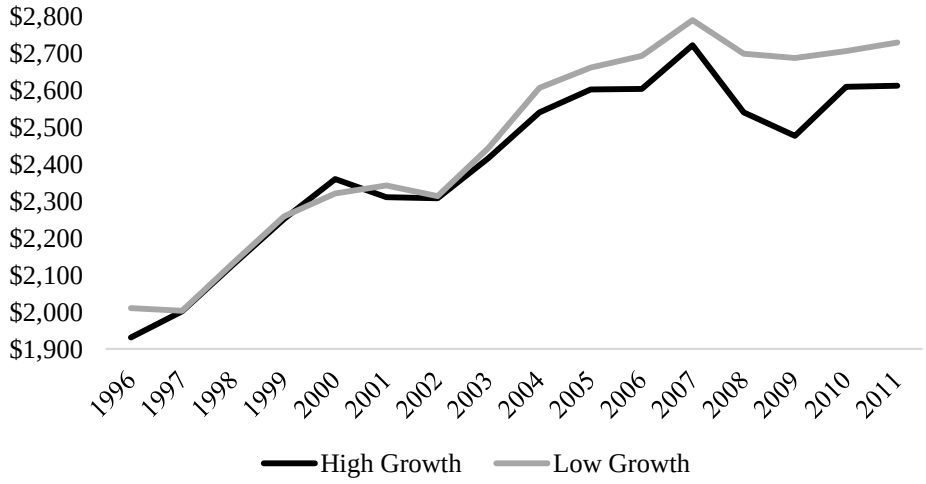

Figure 4: Average State Poverty Rate by Cohort, Index=2001

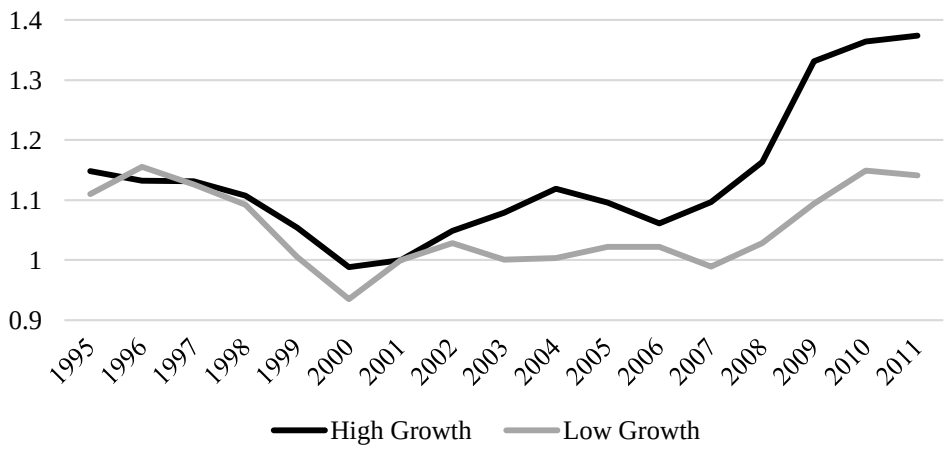

Figure 5: BBCE Adoption of High Growth and Low Growth States by Year

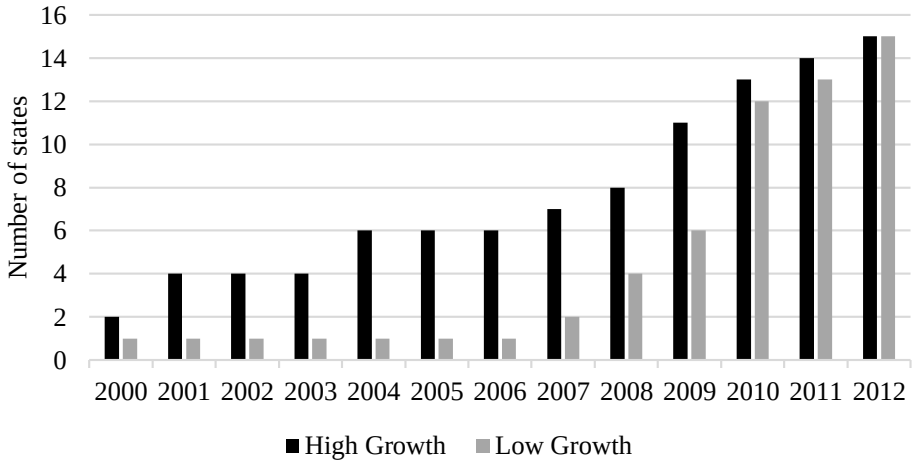

Figure 6: Percentage of SNAP Households with Recertification Period of 1 to 3 Months