Household Consumption Responses to SNAP Participation

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Abstract

This paper studies the effect of SNAP benefits on Food Away From Home (FAFH) expenditure. The study contributes to a sparse amount of literature that examines where SNAP recipients spend their benefits. A causal link has been shown to exist in recent literature between FAFH and obesity which makes this paper timely and relevant. This study makes a theoretical contribution to SNAP-related literature by incorporating household food security status as a determinant of consumption decisions. Empirical estimation is conducted by comparing the consumption patterns of SNAP participants relative to SNAP-eligible non-participants. The results show that SNAP participation significantly decreases FAFH consumption and that this effect is substantially different for households of different food security levels.

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 to numerous households throughout the United States. In the past decade or so, SNAP participation has more than doubled, rising from about 17 million individuals in 2000 to over 47 million in 2013 (USDA: Food and Nutrition Service (a), 2014). The Great Recession of 2007 led large numbers to fall below Federal Poverty Guidelines (FPG). In response, several states sought to increase SNAP participation through a variety of policy initiatives directed at easing eligibility requirements. In addition, average monthly benefit per person increased from $96 in 2007 to approximately $133 in 2013 (USDA: Food and Nutrition Service (a), 2014).

Surrounding the recent expansion of SNAP is the discussion of its effect on patterns of food consumption. While economic literature has tackled this issue from several different perspectives, an overwhelming amount of evidence exists on the relationship between SNAP participation and obesity. Although this strand of literature is still largely inconclusive, causal relationships have been shown to exist among certain demographic groups. In particular, SNAP participation has been positively linked with obesity among young girls (Robinson and Zheng, 2011) and among adult females (Baum, 2011). On the other hand, some research suggests that no relationship exists between participation and obesity among women (Fan, 2010) and even a negative relationship for children (Burgstahler *et al.*, 2012).

The purpose of this paper is to study the link between SNAP and obesity by testing the effect of SNAP benefits on household food consumption. Following the notion that Food Away from Home (FAFH) is more likely to cause obesity relative to Food At Home (FAH), this paper

explores how households adjust their consumption of FAFH when SNAP benefits are received. Increased household consumption of FAFH in response to SNAP participation suggests that obesity is the unintended consequence of SNAP. A novel theoretical framework is developed that incorporates the initial household food security status and an empirical test is proposed to measure the impact of participation on FAFH expenditure. The model compares FAFH expenditure of participants with eligible non-participants and provides strong evidence of a negative relationship between SNAP and FAFH.

The paper is organized in the following way. Section II discusses the background of SNAP, eligibility requirements, and the link between SNAP and obesity. Section III establishes a theoretical framework. Section IV describes the datasets used for empirical analysis. Section V proposes a simple empirical model to test the relationship between participation and FAFH. Section VI presents results from the empirical model and section VII concludes.

II. Background

Supplemental Nutrition Assistance Program (SNAP)

SNAP, formerly known as the Food Stamp Program, is the largest federal program targeting food security in the US. While the program is funded at the federal level, it is administered by state governments. Apart from administrative expenses, for which states can get reimbursed by the federal government in some instances, states face few or no other SNAP-related expenses. As a result, states generally encourage eligible households to participate.

Direct Eligibility

To receive SNAP benefits, households must meet the minimum eligibility criteria set by the federal government. Applicants must pass three tests that make up most of the federal criteria to qualify. First, the asset test specifies the maximum value of liquid assets such as bank accounts and motor vehicles that a household can possess to be eligible. Second, households must satisfy the gross monthly income standard. The gross income test is set to 130 percent of Federal Poverty Guidelines (FPG), which increase incrementally with number of household members (USDA: Food and Nutrition Service (b), 2014). Finally, the net income test specifies a maximum monthly net income standard based on 100 percent of the FPG. Net income is calculated by allowing households to claim deductions on gross income for expenses such as dependent care, medical expenses for the elderly and disabled, and child support payments. Each applicant must pass all three tests to be eligible for SNAP. In addition, federal requirements include rules for employment and special treatment for the elderly and disabled. In general, households with elderly and disabled residents face a more lenient gross monthly income test that allows maximum income up to 165% of FPG.

While minimum eligibility requirements are set at the federal level, states have some leeway in modifying the federal criteria to suit the needs of their residents. States typically target the asset test to customize SNAP eligibility requirements. In response to the Great Recession, most states have relaxed or completely eliminated the asset test. Table 1 in the Appendix shows changes in asset tests in the years following the recession.

Categorical Eligibility

In addition to being directly eligible for SNAP by meeting the federal and state eligibility criteria, households can also qualify by being "categorically eligible" in states that have adopted this rule. Categorical eligibility requires households to be financially eligible for other income-assistance programs such as Temporary Assistance for Needy Families (TANF) to be eligible for SNAP. This allows households that may not pass the SNAP eligibility criteria to automatically become eligible as long as they pass the requirements needed to receive TANF benefits.

Historically, categorical eligibility was based on whether households received cash benefits from these programs. However, in an attempt to streamline eligibility and increase participation, states have turned to offering Broad Based Categorical Eligibility (BBCE), which eliminates the requirement that households must receive cash assistance from TANF to be eligible. Under BBCE rules, households that receive any TANF funded benefits, including non-cash services such as brochures or referrals for assistance, also become eligible for SNAP as long as they fulfill few broad income requirements. Since these services are low-cost and easily justifiable, virtually all households that qualify for any type of TANF benefit automatically qualify for SNAP as well. Table 2 in the Appendix shows a list of BBCE states and their respective eligibility requirements. In addition, Figure 1 is constructed by the author to illustrate different routes a household can take to become SNAP-eligible.

Temporary Assistance for Needy Families (TANF)

TANF is a federal assistance program for low-income families that replaced Assistance for Families with Dependent Children (AFDC) in 1997. The goal of TANF is to provide temporary

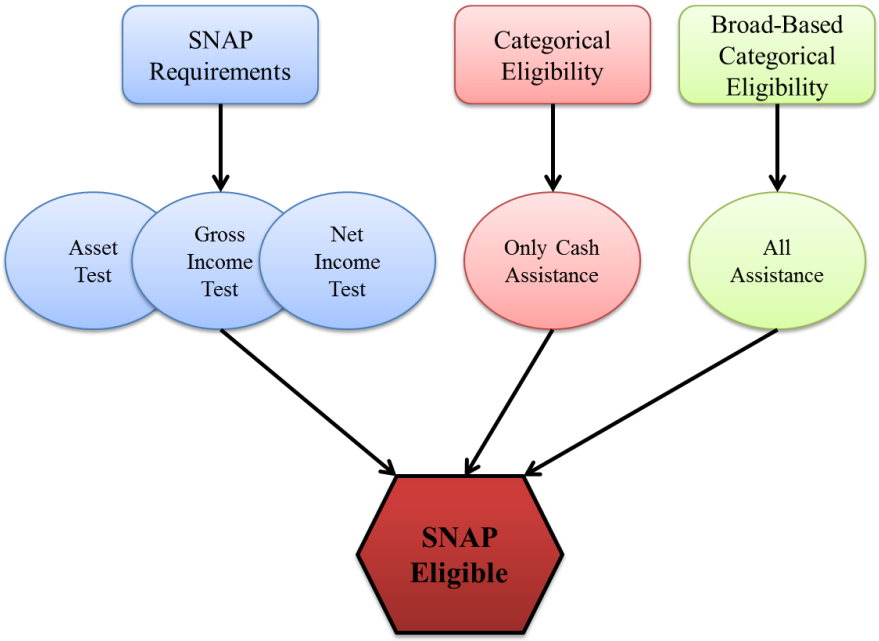

Figure 1. Paths to SNAP Eligibility

financial assistance while weaning households off of federal programs through services like employment training.

Unlike SNAP, which provides benefits for an indefinite period of time, TANF cash-assistance is limited to no more than 60 months. States have the option of shortening this period of assistance; however, they cannot allow recipients to exceed it. In addition, while SNAP is funded by the federal government for any number of households that are eligible, TANF is funded through federal block grants awarded to each state through which the states fund and administer their program. Unlike SNAP, to receive this grant states have to contribute a portion of their own funds to provide assistance for low-income families.

Similar to SNAP, TANF requirements for BBCE are based on income and assets. With the exception of a few, all states adhere to the asset limit and specify different asset levels for households of different demographics. Both gross and net income tests apply and are expressed

as a percentage of FPG. While there is a substantial bit of variation in state gross income tests, no state allows a household without elderly or disabled individuals to exceed 200 percent of FPG. For almost all states, the net income test is either 100% of FPG or does not apply at all.

Link between SNAP and Obesity

There are two channels through which SNAP participation may lead to obesity. First, SNAP participants might be caught in what Townsend *et al.* (2001) call the "food acquisition cycle". According to this theory, food consumption peaks within the first few days of benefit receipt resulting in binge-eating behavior during this period. Consequently, by the fourth week resources run low and households are forced to cut back on food consumption leading to acute food insecurity until SNAP benefits are received again. This binge-eating and food insecurity cycle repeats itself and over time may lead to gradual weight gain (Wilde & Ranney, 2000).

Second, SNAP benefits may be perceived as an income shock by some households. As a result, even though SNAP is strictly an in-kind transfer, it may lead to increased expenditure on other goods and services by participants, including expenditure at fast food and table-service restaurants. Empirical evidence shows that these are unhealthy sources of food and could potentially lead to a myriad of health issues including obesity. Binkley (2008) has shown that eating at both fast food and table-service restaurants causes higher caloric intake relative to meals prepared at home. In addition, Mancino *et al.* (2009) find that in addition to higher caloric intake, FAFH also reduces diet quality. Therefore, if SNAP benefits are mainly used to increase FAFH expenditure, then SNAP may contribute to obesity among low-income households.

The focus of this study is the second channel which links obesity to SNAP participation. If participation results in increased FAFH expenditure by low-income households, then the

program fails to achieve its objective of targeting obesity by encouraging consumption of better quality diets. On the other hand, if participants decrease FAFH consumption then SNAP has the intended consequence of providing an impetus for households to consume more FAH.

III. Theoretical Framework

One of the main contributions of this study is the introduction of a new theoretical framework to examine the effect of SNAP participation on consumption. A graphical illustration of this new framework is conveyed in Figure 2. As shown, the quantity of FAH and FAFH, measured by number of calories, is determined by a number of components.

The original budget constraint of the household is given by BC_0. Note that the slope of BC_0 is relatively steep indicating that FAFH is cheaper than FAH. This is based on the assumption that the type of restaurants that low-income households are likely to frequent are fast-food restaurants. Fast food restaurants typically specialize in offering a large amount of calories at a low price. All major fast food chains including McDonalds, Burger King, Taco Bell, and KFC, offer the "dollar-menu" which provides meals for around $1. The nutritional value of these items is generally debatable but there is evidence to show that not only do these items provide a large number of calories for just $1 but they also deliver a considerable amount of protein, carbohydrates, and essential vitamins (Magee, 2008). For low income households, the alternative to fast food is food prepared at home which may be healthier but not as cost-effective as fast food dollar-menu items. Therefore, the budget constraint faced by SNAP eligible households is likely to have a steep slope.

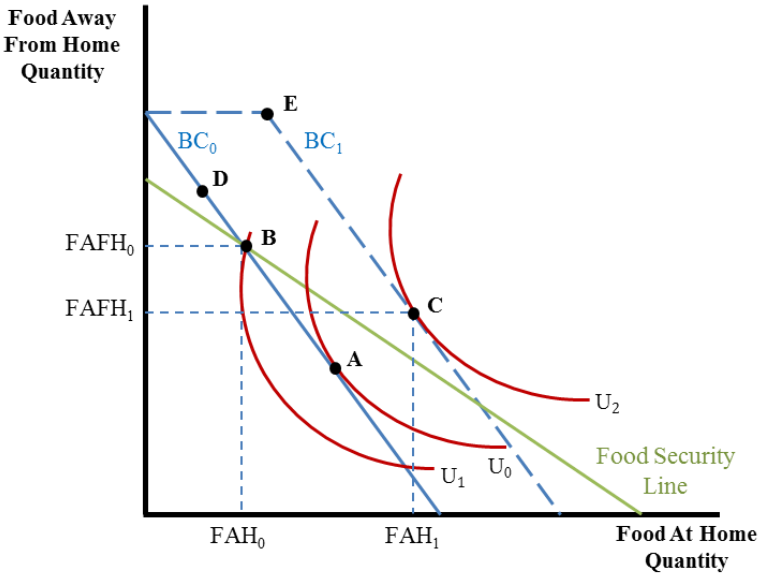

Figure 2: Household consumption response to SNAP benefits

Note: BC is an abbreviation for Budget Constraint, FAFH for Food Away From Home, and FAH for Food At Home. U represents indifferent curves.

According to standard theory developed in previous literature (Hoynes *et al.*, 2014; Huang *et al.*, 1981; Fan, 2010), SNAP benefits are perceived as a pure income shock and cause a parallel outward shift of BC_0 to the new budget constraint given by BC_1. As shown in Figure 2, BC_1 is flat at the top and kinks at point E which reflects the restriction that SNAP benefits can only be used to purchase FAH and not FAFH. The length of the flat restricted portion equals the amount of benefits a household receives. The slope of the BC_1 is identical to that of BC_0 because there is no change in the relative prices of FAFH and FAH.

This paper adds the Food Security Line (FSL) to the standard theory as shown in Figure 2. The FSL is a measure of the minimum amount of calories households need to consume to be food secure. Therefore, regardless of the consumption preference of households, they are constrained by the lower bound on calories needed for food security as depicted by the FSL. For example, a household that prefers consumption bundle A in Figure 2 would be compelled to

consume bundle B because bundle A lies below the FSL and would make the household food insecure. This outcome is inefficient because bundle B lies at a lower indifference curve U_1. Note that the slope of the FSL is assumed to be relatively flat. This indicates that households need a smaller quantity of FAFH than FAH to be food secure. Literature has shown that a calorie from FAFH consumed at fast food and table-service restaurants has higher energy density than a calorie from FAH (Binkley, 2008). In other words, FAFH tends to keep individuals full for longer relative to FAH. Therefore, a smaller quantity of food is needed from FAFH relative to FAH for a low-income household to consume at or above the food security level.

One of the determinants of the effect of SNAP benefits on consumption is the household's position on the original budget constraint. The FSL is a binding constraints for households that prefer consumption bundles below the FSL. These households will likely consume bundle B in Figure 2. When benefits are received, however, the new budget constraint BC_1 increases the variety of bundles the households can consume without being bound by the FSL. As a result, for a household that prefers bundle A but is forced to consume bundle B, bundle C becomes available which allows the household to reach a higher indifference curve. Note that by moving from bundle B to bundle C the household decreases consumption of FAFH and increases consumption of FAH. The case of households for which the FSL is not binding is straightforward. SNAP benefits allow these households to increase consumption of both FAH and FAFH. For example, when a household that prefers bundle D in Figure 2 receives SNAP benefits, the household will likely choose bundle E at the kink of BC_1 because E lies at the household's highest indifference curve.

Another factor that determines the post-SNAP consumption is the household's income expansion path as reflected in the movement of the indifference curves from BC_0 to BC_1. For the case where FAFH is an inferior good relative to FAH, the income expansion path will exhibit a negative slope as FAFH expenditure decreases with income. Conversely, if FAFH is normal or superior to FAH then the income expansion path will slope upwards because SNAP benefits will allow households to increase consumption of both goods. The post-SNAP consumption bundles will then depend on the magnitude and the sign of the slope of the income expansion path.

IV. Data

Current Population Survey (CPS)

The primary source of data used in this paper is the Current Population Survey (CPS) Food Security Supplement (FSS) conducted by the Census Bureau and sponsored by the USDA. The CPS-FSS is a large, nationally representative dataset and a key source of micro-data on a number of food security issues. In addition to collecting extensive information on a number of facets of food security, the survey also asks households about SNAP participation. For the purposes of this study, the 2009 to 2011 cycles of the CPS-FSS are used. Data older than 2009 is excluded to avoid biases from any pre-recession trends and data after the 2011 cycle is excluded to align CPS-FSS with the availability of other data sources used in this paper.

A major strength of the CPS-FSS is the availability of a measure of each household's food security status. This plays a vital role in the analysis because it allows the model to isolate the effect of SNAP on households that are above or below the FSL. To gain insight into FAFH consumption of households, responses to the question regarding the amount of money spent at restaurants, fast food places, cafeterias, and vending machines are used. Even though the survey

does not distinguish between these four sources of food, it is reasonable to assume that they all fall in the FAFH category and they all have negative health implications. In addition, the survey directly asks households to identify the average amount of benefits received per month. Summary statistics of the CPS data are provided in Table 3.

Panel Study of Income Dynamics (PSID)

Despite the numerous strengths of the CPS-FSS, it does a relatively poor job of collecting data on household assets which is an important piece of information in determining SNAP eligibility. To address this problem, data from the Panel Study of Income Dynamics (PSID) is utilized. The PSID is a nationally representative longitudinal dataset directed by the University of Michigan that has followed families in the United States since 1968. The survey represents families throughout a range of incomes in the US although greater weight lies with low-income households due to PSID's focus on poverty at the time of its advent. According to the structure of the survey, for the relevant timeframe only the 2009 and 2011 cycles of the survey are available, with 2011 being the latest data release.

The PSID directly asks respondents about the value of liquid assets owned by their household. The asset information available in the PSID encompasses almost all liquid assets that could be considered valid for eligibility, including checking and savings accounts, money market funds, certificates of deposit (CDs), government savings bonds, and Treasury bills. Note that long term assets such as Individual Retirement Accounts (IRAs) and private annuities are not counted in the asset test and are easily separable in the PSID. In addition, although motor vehicles are still considered liquid assets according to federal and state requirements, almost all states exempt the value of the first vehicle and most states exempt all vehicles. Therefore,

although data on vehicle ownership is unavailable in the PSID, it causes trivial biases in estimation. Table 4 shows the summary statistics of the PSID sample.

Imputation of Assets

Since there is no way to identify common households, if they exist, between the CPS and the PSID, some method of imputation is required to match assets of households in the PSID to households in the CPS. The imputation technique employed involves matching asset values of representative households in the PSID to each household in the CPS based on shared characteristics. This is achieved by first measuring the value of liquid assets for each household in the PSID and regressing it with a group of explanatory variables to obtain coefficients. These coefficients are then used to estimate the value of assets for each household in the CPS. As a result, an instrument for assets of CPS-households is obtained from the PSID.

A number of studies have identified the variables that are relevant to determining household assets. Carney and Gale (1999) find that race, income, age, education, and marital status significantly correlate with financial assets. Scholz and Seshadri (2007) show that having children substantially reduces the net worth of households, with each additional child accounting for over $6000 decline in net worth. Finally, Beverly *et al.* (2008) identify financial literacy among other variables that lead a household to accumulate wealth. Although current literature provides a list of explanatory variables, only ones available in both datasets can be used to match assets from one dataset to another.

The results from the regression for each year are shown in Table 5. A number of variables significantly determine the value of assets including age, education, employment status of household head and spouse, number of household members, and the presence of elderly in the

household. However, the main purpose of imputation is matching not estimation therefore all coefficients from the regression are used, regardless of statistical significance, to measure assets for CPS households. In other words, the primary concern is not to identify variables that determine assets but to match assets based on common variables. The imputation provides asset values for about 94 percent of the CPS sample, with the remaining 6 percent comprising of 9,702 missing values. This is the natural result of the limited number of shared variables available in the two datasets.

Eligibility

The main issue in any SNAP-related research is the problem of endogeneity. While participation may have certain effects on household behavior, household behavior may also influence participation. For example, to study the effect of participation on FAFH, the researcher must be able to identify an exogenous factor that influences participation but not consumption. If individuals that prefer FAFH are more likely to join SNAP relative to individuals that do not prefer FAFH, no causal link between SNAP and FAFH consumption can be identified. A number of researchers have developed innovative instruments to tackle the endogeneity problem. Baum (2011) uses the value of vehicles owned by the household, the presence of an elderly member in the household, and state level variation in eligibility criteria as instruments for food stamp benefits. Meyerhoefer & Pylypchuk (2008) use expenditures on SNAP outreach programs, each state's fingerprint requirement for SNAP application, and periodic recertification requirements of the state as instruments for SNAP participation. Robinson & Zheng (2011) address endogeneity in both, participation and eligibility. First, they use Body Mass Indices (BMIs) from the previous year to determine current year participation. Second, they instrument for eligibility using the

value of the household's vehicle and changes in eligibility rules. Burgstahler *et al.* (2012) use county SNAP participation rate, unemployment rate, median income, and other instruments to estimate participation for each household. While each of these approaches has some validity, they are broad-stroke measures at best.

A substantial contribution of this study is the use of a more precise classification of SNAP eligibility. Instead of using instruments, eligibility is determined directly by comparing household characteristics to the federal and respective state's minimum eligibility requirements, resulting in a clear distinction between eligible and non-eligible households. Using imputed assets from the PSID and gross income from the CPS, eligibility tests are conducted first. About 57 percent of the sample passes the asset test and approximately 28 percent of households pass the gross income test. A total of 24,486 households pass both tests comprising of about 15 percent of the entire sample. A portion of households that do not pass the income and asset tests can still qualify through BBCE. For BBCE-states, TANF eligibility rules are applied next. Approximately 54 percent of households pass the TANF gross income test but only about 9 percent pass the TANF asset test. This is no surprise given that TANF asset requirements for eligibility are more stringent and that most states still apply the TANF asset test. Finally, after incorporating BBCE the total number of households that are eligible to receive SNAP benefits is 27,100 and make up about 17% of the entire sample.

Note that the net income test for both SNAP and TANF is not used to determine eligibility. This is because to calculate net income extensive knowledge of exemptions and deductions (child care, shelter costs, medical expenditure, etc.) is needed for each household. Not only is this data unavailable in the CPS and PSID, due to the sensitive nature of this information it is rarely available in other economic datasets as well. However, not incorporating the income

test in eligibility requirements might not create significant biases. The reason is that most low-income households on the margin of eligibility earn hourly wages. Therefore, it is relatively easy to adjust income to meet the eligibility criteria, especially if the household already passes the gross income test. In other words, households that barely miss the minimum net income requirement for eligibility can become eligible by foregoing a small number of hours of work.

V. Model

To determine the impact of participation on FAFH expenditure, food consumption of SNAP participants is compared to that of eligible non-participants. The central question that the model attempts to address is the following: does the receipt of SNAP benefits lead households to decrease consumption of FAFH? If SNAP beneficiaries do indeed consume less FAFH relative to eligible non-participants, then SNAP fulfills the dual purpose of making households food secure and encouraging consumption of a healthier diet. The empirical specification of the model is straightforward. Restricting the data to include only SNAP eligible households, the following equation is constructed for testing:

$$FAFH_{it} = \beta_0 + \beta_1 SNAP_{it} + \beta_2 SNAPamt_{it} + \beta_3 FSS_{it} + \beta_4 SNAPFSS_{it} + \beta_5 totalfood_{it} + \beta_6 HH_{it} + \beta_7 X_{it} + \varepsilon_{it}$$

where $FAFH_{it}$ is the dependent variable that measures the total amount of money spent by household i on eating out in year t. Recall that expenditures classified as FAFH include those at table-service restaurants, fast food restaurants, cafeterias, and vending machines. While $FAFH_{it}$ reflects annual expenditure, due to the timing of CPS-FSS the variable is based on weekly expenditure observed in December of each respective year. The independent variable of interest $SNAP_{it}$ is dichotomous and equals 1 if the household participated in SNAP in either November

or December of the survey year. This time frame is used to capture the effect of SNAP on dining out behavior in December. For example, a household that participated in SNAP in only January of a given year will have long altered its food consumption behavior by December of that year. In contrast, a household that received benefits in November or December of the year will still exhibit SNAP-related dining out behavior. The variable $SNAPamt_{it}$ represents the dollar amount of annual SNAP benefits and is based on average weekly expenditure. The variable FSS_{it} is a measure of the household's food security status and is based on a food security scale constructed by the Economic Research Service (ERS) through a series of 18 questions in the CPS-FSS. FSS_{it} equals 1 if the household is food insecure. The variable $SNAPFSS_{it}$ is an interaction term between $SNAP_{it}$ and FSS_{it} and the variable $totalfood_{it}$ measures total annual household expenditure on food.

The next factor, HH, is a vector representing household characteristics. It includes variables $homeowner$, which measures whether the household resides in a house owned by a resident, and $liquidassets$, which depicts the total amount of liquid assets owned by the household. These two variables jointly account for the wealth effect. The more assets a household owns, the wealthier the household feels and consequently, the more it will spend on costlier food items. HH also includes $hhmembers$, $childrenaged<18$, and $elderlyaged>65$, which represent the number of household members, the number of children younger than 18, and any elderly individuals aged 65 or older present in the household, respectively. In addition, HH includes variable $50kincome$ which is a gauge of whether total annual income earned by all members of the household is less than $50,000 or not. This dummy variable equals 1 if the household earns less than $50,000 a year and 0 otherwise. X is a vector of demographic variables

describing the head of the household. It includes variables that measure gender, age, race, education, employment status, and marital status.

A simple pooled OLS regression is performed to empirically estimate the model. Due to the structure of the CPS, some households in the sample are interviewed for two consecutive years. This is because each household in the CPS is interviewed over a 16 month period. Data is collected for the first four months of a household's inclusion in the survey, followed by a eight month break, and followed by another four months of interviews. Therefore, 8 months of data is collected over 16 months. However, in the model each observation is treated as independent and standard errors are clustered to incorporate correlation between multiple observations for the same household. Violations of OLS assumptions are tested for and discussed in the next section.

VI. Results & Discussion

The results from the simple OLS regression are shown in Table 6 in the Appendix. With the exception of $married$ and $elderlyaged{>}65$, all variables are statistically significant and the F statistic of 114.5 denotes that overall the model is highly significant. Multicollinearity tests are conducted by calculating Variance Inflation Factors (VIFs). The VIFs fall in the range of 1 and 4 for all variables, indicating that multicollinearity is not a big concern. The R-squared is about 32% and a histogram of the error terms shows that they are roughly normally distributed. Therefore, the use of OLS for estimation seems to be reasonable.

The variable of interest, $SNAP$, is highly significant and has a negative coefficient. SNAP participants spend on average about $186 less on FAFH relative to eligible non-participants. Moreover, the variable $SNAPamt$ shows that an additional dollar of SNAP benefits decreases FAFH expenditure by about 10 cents. These results are consistent with theory developed in

Section III and show that on average SNAP participation allows households to decrease consumption of FAFH. However, this effect differs greatly by household food security status. As the coefficient on FSS indicates, food insecure households spend annually about $230 less on FAFH than food secure households. In contrast, the coefficient on the interaction term $SNAPFSS$ is positive and shows that participation leads food insecure households to spend about $120 more on FAFH relative to food secure households.

Among other significant variables, $totalfood$ depicts that 17% of every additional dollar spent on food is attributed to FAFH expenditure. The coefficients on variables $homeowner$ and $liquidassets$ show that the wealth effect plays an important role in household consumption decisions. The wealthier the household members feel, the more free-handed they tend to be with their resources. In addition, the coefficients on $hhmembers$ and $childrenaged<18$ show that each additional household member increases FAFH expenditure by about $56 a year but if that additional member is a child, FAFH falls by about $62 per year. An explanation for this behavior might be a negative wealth effect. The presence of a dependent child in the household may induce caretakers to feel poorer as they anticipate facing added expenses related to childcare, education, college-funds, insurance premiums, etc. and the caretakers may respond by cutting back on luxuries such as dining out. As expected, the coefficient on $50kincome$ shows that annual income less than $50,000 results in lower FAFH expenditure than income above that threshold. In addition, households with male heads spend more, and households with older and black heads spend less on FAFH than their counterparts, and the greater the level of educational degree attained, the greater the expenditure on FAFH. Finally, household heads that are employed or students spend more on FAFH than their counterparts.

The results show that even though participation allows all households to decrease FAFH expenditure, the effects significantly differ by household food security level. Generally food insecure households spend less on FAFH relative to food secure households, but among SNAP participants food insecure households spend more on FAFH than food secure households. To determine the absolute effect of participation on food insecure households, the same regression is run on a restricted sample of food insecure households only. The results, reported in Table 6, show that participation significantly reduces FAFH expenditure by about $106 per year. Therefore, even though participation causes greater FAFH consumption relative to food secure households, it has a negative absolute effect for food insecure households. The same regression on a restricted sample of food secure households only shows a negative effect also. Participation reduces FAFH expenditure by $179 among food secure households as reported in Table 6.

These results have important implications. First, the model provides strong evidence that SNAP allows households to decrease their FAFH expenditure, regardless of initial food security status. The program is then largely successful at achieving its purpose of encouraging participants to consume healthier diets. Furthermore, the effect of SNAP on FAFH is larger for food secure households relative to food insecure households. A possible explanation for this behavior is that for food secure households, FAFH is an inferior good but for food insecure households FAFH is normal. Then even though the income expansion path for food insecure households might be upward sloping, the decrease in FAFH expenditure might represent movement from a FSL-constrained outcome (bundle B in Figure 2) to an outcome unconstrained by the FSL (bundle C in Figure 2). As a result, the magnitude of FAFH expenditure decrease might be smaller for food insecure households than that of food secure households. Another explanation is that while FAFH might be inferior to FAH for both food secure and food insecure

households, FAFH might be more inferior for food secure households relative to food insecure households. Put differently, while the income expansion path for both food secure and food insecure households is downward sloping, the slope of the income expansion path for food secure households is much steeper than the slope of the income expansion path for food insecure households. As a result, when food secure households receive benefits, they tend to decrease their consumption of FAFH to the point that it is lower than FAFH expenditure by food insecure households.

Note that consistent with theory developed in Figure 2, CPS data shows that food secure households spend on average about $447 per year more on FAFH and about $536 less on FAH than food insecure households. Therefore, food secure households are characterized by large expenditures on FAFH and small expenditures on FAH prior to joining SNAP. This gives credence to the results because the data used for empirical estimation aligns well with the theoretical framework. It also grants some validity to the relatively flat slope of the FSL.

This study makes a substantial contribution to literature regarding the link between SNAP and obesity. The results from previous literature have ranged from showing a significantly positive to an insignificant relationship between SNAP and obesity. In addition, due to the increasing trend in FAFH expenditure in the last few decades (Davis & Stewart, 2002; Stewart *et al*., 2006) and the recent increases in SNAP caseloads, food security targeting welfare policies have come under great scrutiny in the past few years. This study, however, departs from conventional wisdom and provides evidence of a strong negative relationship between the two variables, indicating that SNAP benefits might help alleviate obesity among low income households. The fact that this effect is even larger for food secure households might lend some insight into how obesity targeting programs should be constructed.

VII. Conclusion

This study looked at the effect of SNAP participation on FAFH expenditure. Introducing a measure of household food security status, the theoretical model redefines the way household consumption responses to SNAP participation have traditionally been studied. Empirical estimation is conducted by comparing SNAP participants to eligible non-participants. Eligible households are identified by applying state and federal level eligibility requirements to each household. The model is constructed by generating a pooled cross-section of households using data from the CPS and the PSID and estimated using simple OLS framework. The results show that SNAP benefits decrease FAFH expenditure in general but the effect is much larger for food secure households than food insecure households. An important implication of the results is that SNAP might be used to alleviate obesity in low income households. The different magnitude of effects can be explained by whether FAFH is considered to be an inferior or normal good by food insecure households.

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Table 1. SNAP Asset Test by State

	2009	2010	2011
Alabama	$2,000	No Test	No Test
Alaska	$2,000	$2,000	No Test
Arizona	No Test	No Test	No Test
Arkansas	$2,000	$2,000	$2,000
California	$2,000	$2,000	No Test
Colorado	$2,000	$2,000	No Test
Connecticut	No Test	No Test	No Test
Delaware	No Test	No Test	No Test
District of Colombia	$2,000	No Test	No Test
Florida	$2,000	No Test	No Test
Georgia	No Test	No Test	No Test
Hawaii	$2,000	No Test	No Test
Idaho	$2,000	No Test	$5,000
Illinois	$2,000	No Test	No Test
Indiana	$2,000	$2,000	$2,000
Iowa	$2,000	No Test	No Test
Kansas	$2,000	$2,000	$2,000
Kentucky	$2,000	No Test	No Test
Louisiana	$2,000	No Test	No Test
Maine	$2,000	No Test	No Test
Maryland	$2,000	No Test	No Test
Massachusetts	No Test	No Test	No Test
Michigan	No Test	No Test	$5,000
Minnesota	$7,000	No Test	No Test
Mississippi	$2,000	No Test	No Test
Missouri	$2,000	$2,000	$2,000
Montana	No Test	No Test	No Test
Nebraska	$2,000	$2,000	$25,000
Nevada	No Test	No Test	No Test
New Hampshire	No Test	No Test	No Test
New Jersey	$2,000	No Test	No Test
New Mexico	$2,000	No Test	No Test
New York	No Test	No Test	No Test
North Carolina	$2,000	No Test	No Test
North Dakota	No Test	No Test	No Test
Ohio	No Test	No Test	No Test

Table 1. SNAP Asset Test by State (cont.)

	2009	2010	2011
Oklahoma	No Test	No Test	No Test
Oregon	No Test	No Test	No Test
Pennsylvania	No Test	No Test	$5,500
Rhode Island	No Test	No Test	No Test
South Carolina	No Test	No Test	No Test
South Dakota	$2,000	$2,000	$2,000
Tennessee	$2,000	$2,000	$2,000
Texas	$5,000	$5,000	$5,000
Utah	$2,000	$2,000	$2,000
Vermont	No Test	No Test	No Test
Virginia	$2,000	$2,000	$2,000
Washington	No Test	No Test	No Test
West Virginia	No Test	No Test	No Test
Wisconsin	No Test	No Test	No Test
Wyoming	$2,000	$2,000	$2,000

Source: New America Foundation. Retrieved from http://assetlimits.newamerica.net/content/asset-limits-your-state

Table 2. Broad Based Categorical Eligibility by State (2011)

State	TANF Asset Limit	TANF Gross Income Limit
Alabama	No limit on assets[2]	130%
Arizona	No limit on assets	185%
California	No limit on assets	130%
Colorado	No limit on assets[2]	130%
Connecticut	No limit on assets	185%
Delaware	No limit on assets	200%
District of Columbia	No limit on assets	200%
Florida	No limit on assets	200%
Georgia	No limit on assets[2]	130%
Guam	No limit on assets	165%
Hawaii	No limit on assets	200%
Idaho	No limit on assets	130%
Illinois	No limit on assets[2]	130%
Iowa	No limit on assets	160%
Kentucky	No limit on assets[2]	130%
Louisiana	No limit on assets	130%
Maine	No limit on assets	185%
Maryland	No limit on assets	200%
Massachusetts	No limit on assets[2]	200%[3]
Michigan	$5,000 (vehicles over $15,000 included)	200%
Minnesota	No limit on assets	165%
Mississippi	No limit on assets	130%
Montana	No limit on assets	200%
Nebraska	$25,000 for liquid assets	130%
Nevada	No limit on assets	200%
New Hampshire[1]	No limit on assets	185%
New Mexico	No limit on assets	165%
New Jersey	No limit on assets	185%
New York	No limit on assets[2]	130%
North Carolina	No limit on assets	200%
North Dakota	No limit on assets	200%
Ohio	No limit on assets[2]	130%
Oklahoma	No limit on assets	130%
Oregon	No limit on assets	185%
Pennsylvania	No limit on assets[2]	160%

Table 2. 2011 Broad Based Categorical Eligibility by State (continued)

State	TANF Asset Limit	TANF Gross Income Limit
Rhode Island	No limit on assets[2]	185%
South Carolina	No limit on assets[2]	130%
Texas	$5,000 (excludes 1 vehicle)	165%
Vermont	No limit on assets	185%
Virgin Islands	No limit on assets[2]	130%
Washington	No limit on assets	200%
West Virginia	No limit on assets	130%
Wisconsin	No limit on assets	200%

[1] In New Hampshire, only households with at least one dependent child are eligbile for BBCE

[2] In these states, households with seniors or people with disabilities and gross income under 200 percent of poverty do not face an asset limit. Those over 200 percent of poverty are not categorically eligible and do face a $3,000 asset limit.

[3] Households without children have a gross income limit of 130 percent of FPG

Source: USDA Food and Nutrition Service

Table 3. Current Population Survey Descriptive Statistics

Variable	Mean	Min	Max
male	0.4305	0	1
age	50.754	15	85
race-white	0.7511	0	1
race-black	0.1758	0	1
race-asian	0.0349	0	1
educ-college	0.1800	0	1
educ-masters	0.0344	0	1
educ-advanced	0.0122	0	1
married	0.3434	0	1
employed	0.4258	0	1
student	0.0345	0	1
homeowner	0.5177	0	1
hhmembers	2.5652	1	15
childrenaged<18	0.6031	0	12
elderlyaged>65	0.3972	0	1
family income			
less than $5000	0.1006	0	1
$5000 to $7499	0.0645	0	1
$7500 to $9999	0.0939	0	1
$10000 to $12499	0.1290	0	1
$12500 to $14999	0.1132	0	1
$15000 to $19999	0.1001	0	1
$20000 to $24999	0.0651	0	1
$25000 to $29999	0.0415	0	1
$30000 to $34999	0.0231	0	1
$35000 to $39999	0.0122	0	1
$40000 to $49999	0.0137	0	1
$50000 to $59999	0.0098	0	1
$60000 to $74999	0.0128	0	1
$75000 to $99999	0.0144	0	1
$100000 to $149999	0.0130	0	1
$150000 and over	0.0071	0	1
dining out	0.3383	0	1
dining out amount – participants	391.84	0	13312
dine out amount – full sample	629.83	0	51948
SNAP	0.1824	0	1
SNAP amount	53.313	0	700
Total observations	26052		

Table 4. Panel Study of Income Dynamics Descriptive Statistics

	2009			2010		
Variable	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
liquidassets	52558	-200	26900000	59200	-150	36500000
male	0.7002	0	1	0.7807	0	43
age	44.501	17	97	3.0757	1	9
race-white	0.5949	0	1	0.5949	0	1
race-black	0.3500	0	1	0.3500	0	1
educ-college	0.2295	0	1	0.2292	0	1
educ-masters	0.0600	0	1	0.0601	0	1
educ-advanced	0.0197	0	1	0.0197	0	1
married	0.5417	0	1	0.5436	0	1
employed	0.6863	0	1	0.6776	0	1
homeowner	0.5520	0	1	0.5584	0	1
hhmembers	2.6401	1	12	2.6298	1	14
childrenaged<18	0.8383	0	9	0.8120	0	11
elderlyaged>65	0.1779	0	1	0.2096	0	1
family income						
less than $5000	0.0349	0	1	0.0371	0	1
$5000 to $7499	0.0174	0	1	0.0188	0	1
$7500 to $9999	0.0290	0	1	0.0320	0	1
$10000 to $12499	0.0281	0	1	0.0322	0	1
$12500 to $14999	0.0247	0	1	0.0253	0	1
$15000 to $19999	0.0595	0	1	0.0621	0	1
$20000 to $24999	0.0545	0	1	0.0558	0	1
$25000 to $29999	0.0540	0	1	0.0520	0	1
$30000 to $34999	0.0520	0	1	0.0558	0	1
$35000 to $39999	0.0493	0	1	0.0508	0	1
$40000 to $49999	0.0922	0	1	0.0856	0	1
$50000 to $59999	0.0796	0	1	0.0738	0	1
$60000 to $74999	0.1028	0	1	0.1048	0	1
$75000 to $99999	0.1207	0	1	0.1173	0	1
$100000 to $149999	0.1184	0	1	0.1172	0	1
$150000 and over	0.0827	0	1	0.0789	0	1
SNAP	0.1512	0	1	0.1816	0	1
SNAPamount	60.881	0	8000	87.6369	0	8000
Total observations	6554			6554		

Table 5. OLS Regression on Liquid Assets

	2009		2011	
	Coefficient	**Standard Error**	**Coefficient**	**Standard Error**
male	1787.918	(15191.8)	1506.5	(2053.807)
age	1527.306***	(509.0813)	5067.793	(3824.273)
race-white	12167.82	(25893.31)	25226.42	(35229.48)
race-black	-7359.457	(26433.24)	4100.002	(35862.14)
race-asian	4954.102	(49052.15)	-9402.82	(66616.15)
race-indian	-23258.84	(63557.67)	-15625.89	(86228.23)
race-native	78291.97	(160055.1)	34159.32	(212302.5)
educ-highschool/GED	-1334.962	(11487.56)	-1388.58	(15578.89)
educ-college	41420.19***	(13227.18)	50527.56***	(18210.02)
educ-masters	15934.05	(22203.26)	45110.09	(29787.22)
educ-advanced	182494.7***	(35109.27)	313952.8***	(48464.82)
married	40399.28**	(19962.45)	47409.9**	(23507.56)
widowed	-4787.549	(26082.13)	16068.09	(33222.97)
divorced	-20549.92	(16960.78)	-14188.6	(21642.06)
employed	-26492.16	(16813.76)	-56697.63**	(24355.03)
retired	94189.88***	(23613.34)	126912.6***	(30339.51)
disabled	12508.4	(25530.71)	830.2532	(34941.63)
student	-5691.078	(37326.57)	4674.093	(51182.4)
self-employed	21054.11	(15485.67)	56681.31***	(20562.64)
paid by the house	16935.23	(12078.74)	36970.41**	(16638.59)
homeowner	-2147.881	(11959.94)	18506.91	(15660.84)
spouse employed	-71684.23***	(14065.29)	-92017.67***	(18772.2)
hhmembers	-16643.74**	(8215.691)	-18469.26*	(10761.31)
childrenaged<18	9024.083	(9524.178)	9107.044	(12209.89)
elderlyaged>65	-40238.29**	(18514.3)	-19212.06	(21354.53)
family income:				
less than $5000	40272.65	(388897.2)	-40275.36	(364426.2)
$5000 to $7499	39987.88	(389429.3)	-33981.16	(365944.1)
$7500 to $9999	17257.57	(388738)	-57274.31	(364865.6)
$10000 to $12499	28056.65	(388888)	-54881.98	(364731.1)
$12500 to $14999	35237.16	(389083.7)	-44059.98	(365203.9)
$15000 to $19999	36022.99	(388487.2)	-31918.37	(363859.9)
$20000 to $24999	38399.25	(388601.1)	-34311.1	(363947.1)
$25000 to $29999	61441.11	(388684.9)	-25787.98	(363983)
$30000 to $34999	55888.28	(388774.8)	-21138.34	(363876)

[continued on the next page]

Table 5. OLS Regression on Liquid Assets (continued)

	2009		2011	
	Coefficient	**Standard Error**	**Coefficient**	**Standard Error**
family income:				
$35000 to $39999	61093.88	(388828.5)	-6633.037	(363960.6)
$40000 to $49999	68078.38	(388627.8)	-11946.47	(363527.9)
$50000 to $59999	70247.46	(388729.5)	10266.97	(363629.3)
$60000 to $74999	87005.46	(388719.5)	21249.88	(363458.9)
$75000 to $99999	107552.2	(388772.2)	48527.18	(363433.6)
$100000 to $149999	126728.2	(388873.5)	73403.5	(363497.5)
$150000 and over	340846.7	(389058.5)	311797.7	(363828.3)
SNAP	15582.83	(17399.72)	12925.57	(22203.62)
SNAPamount	8.686302	(18.57748)	7.857709	(18.36266)
constant	-83027.73	(389689.7)	17998.98	(365909.9)

*** significant at the 1% level

** significant at the 5% level

* significant at the 10% level

Table 6. OLS Regression: Effect of SNAP Participation on FAFH Expenditure

	Full Sample		Food Insecure Only		Food Secure Only	
	Coefficient	**Standard Error**	**Coefficient**	**Standard Error**	**Coefficient**	**Standard Error**
SNAP	-186.09***	35.169	-106.05***	33.999	-179.4***	39.8957
SNAPamt	-0.1034***	0.0103	-0.0564***	0.011	-0.1086***	0.015
FSS	-229.93***	25.517	-		-	
SNAPFSS	120.63***	40.027	-		-	
totalfood	0.17304***	0.0097	0.0714***	0.007	0.2153***	0.0128
homeowner	77.016***	20.562	87.96***	30.496	56.18***	26.143
liquidassets	0.44212***	0.1182	0.2086	0.168	0.4449***	0.1283
male	137.06***	22.991	67.97***	30.962	163.7***	27.989
age	-8.7547***	1.1985	-9.173***	1.493	-6.861***	1.4496
race-black	-107.53***	24.494	-54.76*	31.620	-96.16***	32.158
educ-college	251.72***	31.000	7.654	42.035	285.2***	35.906
educ-masters	449.46***	81.797	101.2	110.867	445.1***	89.077
educ-advanced	349.80**	165.79	-153.5	315.824	304.22*	168.11
married	-26.136	26.717	-115.1***	37.828	-37.27148	32.144
employed	177.47***	26.903	158.6***	33.334	168.1***	34.929
student	379.08***	70.461	136.2	125.172	484.7***	78.909
hhmembers	-85.908***	14.196	11.76	13.613	-133.38*	19.288
childrenaged<18	-69.104***	15.066	-54.29***	19.754	-51.3***	19.806
elderlyaged>65	20.892	34.264	26.93	39.837	12.023	43.748
50kincome	-703.86***	75.060	-721.2***	230.448	-634.9***	75.979
constant	1138.9***	96.109	1268.9***	242.475	860.6***	106.077

*** significant at the 1% level

** significant at the 5% level

* significant at the 10% level