The Supplemental Nutrition Assistance Program: Current Restricted Expenditures

PRELIMINARY AND INCOMPLETE – DO NOT CITE

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Abstract: National concerns over food insecurity and obesity have prompted legislation seeking to further restrict Supplemental Nutrition Assistance Program (SNAP) purchases. The objective of this study is to provide insight on the potential impact of the proposed purchase restrictions, by comparing SNAP eligible participant and non-participants' expenditures on current SNAP restricted items i.e. alcohol, hot foods, vitamins/meal supplements and SNAP unauthorized retailer purchases. Lognormal double-hurdle models, employing an instrumental variables approach to control for the potential endogeneity of SNAP participation, are estimated using data from the National Household Food Acquisition and Purchase Survey (FoodAPS). Preliminary results indicate that participation in SNAP does not significantly affect households' expenditures on current SNAP restricted foods. These results provide further evidence that proposed SNAP restrictions on sugar-sweetened beverages and snack foods are unlikely to affect SNAP households food purchases.

Key Words: SNAP, Restrictions, Expenditures, Instrumental Variables, Policy

Introduction

The United States is currently faced with two major food and nutrition challenges, representing both extremes of hunger: obesity and food insecurity. In 2016, over 12% of the population was food insecure, meaning they did not have physical, social and economic access to sufficient, safe and nutritious food (Coleman-Jensen et al. 2017; Barrett 2010). At the other extreme, 36.1% of American adults were classified as obese from 2011 to 2014 (Ogden et al. 2015). As the nation's largest food safety net program, The Supplemental Nutrition Assistance Program (SNAP) provides food assistance to over 42 million low-income households (USDA 2018b). In providing assistance, SNAP aims to directly address the two major food and nutrition issues facing the US. Stated goals of the program include minimizing food insecurity and improving the nutritional quality of low-income households' diets (Gregory et al. 2013).

Several studies (that account for self-selection of food insecure households into SNAP), have shown that participation in SNAP reduces food insecurity (Gundersen et al. 2017; Shaefer and Gutierrez 2013; Kreider et al. 2012; Nord and Coleman-Jensen 2011; Ratcliffe et al. 2011; Mykerezi and Mills 2010; Yen et al. 2008). Further, while findings are mixed, recent literature indicates that participation in SNAP either has no effect or decreases the incidence of obesity among program participants (Almada et al. 2016; Gundersen 2015). Despite these improvements, the prevalence of food insecurity and obesity remains higher for SNAP households than the average US household. Coleman-Jensen et al. (2017) find that 51.2% of SNAP households are food insecure, while Almada et al. (2016) and Leung and Villamor (2010) find that between 38.5% and 44.5% of SNAP participants are obese.

National concerns over food insecurity and obesity, particularly among low-income households, have prompted legislation seeking to add additional purchase restrictions to SNAP. Currently, SNAP benefits can be used to purchase any food and beverage items with the exception of alcohol, hot foods, vitamins and meal supplements and food from

SNAP unauthorized retailers. Since 2000, 23 states have proposed legislation that seeks to restrict the purchase of additional items under the SNAP program (Leschewski and Weatherspoon 2018). The majority of proposed restrictions aim to prohibit the purchase of food and beverages with low nutritional quality, including sugar-sweetened beverages (SSBs), snack foods and foods ineligible under the Special Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC) (Leschewski and Weatherspoon 2018). A smaller set of legislation seeks to restrict the purchase of luxury foods, such as steak and lobster (H.B. 813 2017; H.B. 2148 2017; S.B. 6761 2016).

Within the literature, several studies question whether the proposed SNAP purchase restrictions would be effective in changing the purchases of program participants (Klerman et al. 2017; Todd and Ver Ploeg 2014; USDA 2013; Barnhill 2011). These studies reference the Southworth hypothesis, which suggests that SNAP benefits and cash are equivalent for households that are infra-marginal i.e. their expenditures on food exceed their SNAP benefits (Southworth 1945). Thus, given an additional SNAP purchase restriction, the Southworth hypothesis implies that infra-marginal households with enough cash to cover their expenditures on the restricted item(s) would not alter their purchases. In an analysis of SNAP households food expenditures, Leschewski and Weatherspoon (2018) find that the average SNAP household could cover their expenditures on SSBs and snack foods with their cash food expenditures given a purchase restriction, but could not cover their expenditures on WIC ineligible foods. Using outcomes from the Summer Electronic Benefit Transfer for Children Demonstration, Klerman et al. (2017) similarly infer that SSB and snack food restrictions are unlikely to have an impact given households' ability to substitute cash for SNAP benefits, but that requiring a set percentage of SNAP benefits to be used to purchase healthy foods would alter SNAP households' expenditures.

However, two recent studies examining a SSB restriction to SNAP find evidence in conflict with the Southworth hypothesis. Based on a field experiment, Lusk and Weaver (2017) find that a SNAP restriction on soda results in decreased soda expenditures among the majority of infra-marginal SNAP households. In a systematic review, Cuffey et al. (2016) obtain estimates of the marginal propensity to spend out of SNAP and non-SNAP income to conclude that a SSB restriction would result in a small, but meaningful decrease in SSB expenditures. Despite being infra-marginal, SNAP households may change their purchases due to the SNAP restriction increasing the stigma or embarrassment associated with using SNAP and/or the inconvenience of having to use two payment methods at checkout (Chrisinger 2017; USDA 2013; Barnhill 2011). Further, Lusk and Weaver (2017) suggest that SNAP purchase restrictions may act as a signal to SNAP households to avoid purchasing the restricted items.

With relatively few studies in the literature, whether proposed SNAP purchase restrictions will significantly alter the expenditures of SNAP households remains unclear. One approach to analyzing the potential impact of SNAP purchase restrictions not yet employed in the literature, is to analyze SNAP households' expenditures on currently restricted food and beverages. The objective of this study is to compare SNAP households' current SNAP restricted expenditures to those of SNAP-eligible, non-

participant households using an instrumental variables approach. Specifically, this analysis will consider expenditures on the following categories of current SNAP restricted foods and beverages: (1) alcohol, (2) hot foods, (3) vitamins and meal supplements and (4) food from SNAP unauthorized retailers. Results from this study will provide insight on whether SNAP purchase restrictions have historically impacted the food and beverage purchases of SNAP households. This insight will serve as a reference from which policymakers can make inferences on the impact of proposed SNAP restrictions on SSBs, snack foods, luxury foods and WIC ineligible foods and beverages.

Methods

Our main outcomes of interest are whether SNAP households' expenditures on current SNAP restricted items (i.e. alcohol, hot foods, vitamins and meal supplements, and food purchased at SNAP unauthorized retailers) differ from those of SNAP-eligible, non-participant households. One complication that arises when analyzing determinants of expenditures on disaggregated goods, such as SNAP restricted food and beverages, is that a large number of households do not purchase the goods of interest during the survey period. Estimation of an Ordinary Least Squares (OLS) regression when the dependent variable contains a large number of zeros will result in inconsistent and biased estimates (Wooldridge 2010). Because zero expenditures represent households' decision not to purchase SNAP restricted foods, as opposed to missing observations, a corner solution model is the most appropriate modeling framework for this analysis (Rao & Qaim 2013). Tobit and double-hurdle models are common corner solution models estimated in the literature. The double-hurdle model is less restrictive than the tobit model in that it allows separate mechanisms to govern households' participation and expenditure decisions (Wooldridge 2010). In this analysis, lognormal double-hurdle models are estimated for each of the following categories of SNAP restricted expenditures: (1) items purchased at SNAP unauthorized retailers, (2) alcohol, (3) hot foods and (4) vitamins and meal supplements.

The lognormal double-hurdle model is defined as follows:

$$y_i = p_i \cdot w_i{}^* = 1[\boldsymbol{x_i}\gamma + snap_i\delta + v_i > 0] \exp(\boldsymbol{x_i}\beta + snap_i\tau + \mu_i) \qquad (1)$$

$$\mu|x \sim Normal\,(0, \sigma^2)$$

where p_i is a binary variable indicating whether household *i* makes a purchase in the SNAP restricted category, $w_i{}^*$ is the log of households' expenditures on the SNAP restricted category, $\boldsymbol{x_i}$ is a vector of control variables, $snap_i$ is a binary indicator of households' participation in SNAP, and μ_i and v_i are error terms (Wooldridge 2010). The lognormal double-hurdle model is estimated in two steps. In step one, or the participation decision, a probit model of p_i on $snap_i$ and $\boldsymbol{x_i}$ is estimated. Given purchase, an OLS regression of $\log(y_i)$ on $snap_i$ and $\boldsymbol{x_i}$ is estimated in step two, or the expenditure decision. Postestimation, the average partial effects (APES) of participation, unconditional expenditures and conditional expenditures are calculated holding other variables at their means. Standard errors for the APEs are obtained using the delta-method (Wooldridge 2010).

A potential issue in estimating the lognormal double hurdle model described in Equation 1 is endogeneity. It is likely that unobservable factors impact both a households' decision to participate in SNAP and their expenditures on SNAP restricted foods. Estimation of Equation 1 without accounting for endogeneity will result in biased, inefficient estimates of the impact of SNAP participation on restricted food purchases. Following Ricker-Gilbert et al. (2009) and Rao and Qaim (2013) this analysis uses an instrumental variables approach to account for the potential endogeneity of SNAP participation. Prior to the estimation of the double-hurdle models, the following control function is estimated via a probit regression:

$$snap_i = z_i + x_i\theta + \varphi_i \qquad (2)$$

where z_i is a vector of instruments for SNAP participation and φ_i is the error term. In order to be valid, the instruments must be correlated with SNAP participation, but uncorrelated with restricted expenditures except through SNAP participation. Following Rigdon et al. (2017), variables capturing state variation in SNAP administrative policies are used as instruments. The residuals from Equation 2 are then included as control variables in both steps of the lognormal double-hurdle model. A significant coefficient on the residuals in either step of the double-hurdle model indicates that endogeneity was present, but has been controlled for.

Data
The National Household Food Acquisition and Purchase Survey (FoodAPS) is the primary data set used in this analysis. Collected by the United States Department of Agriculture's (USDA) Economic Research Service (ERS) and Food and Nutrition Service (FNS) from April 2012 to January 2013, FoodAPS is a nationally representative, cross-sectional dataset consisting of 4,826 households. Households participating in FoodAPS completed a one-week food acquisition diary in which they recorded all food purchased or acquired for at home and away from home consumption.

Study Sample
Given its objective, this study's sample is restricted to SNAP eligible households, both participating and non-participating. In total, 1,581 households in FoodAPS indicated participating in SNAP. Using administrative data, the USDA verified SNAP participation for 1,316 of these households. SNAP-eligible, non-participating households were identified by comparing their household income to the federal poverty line. By law, households with income at or below 130% of the federal poverty line are eligible to participate in SNAP (USDA 2018c). SNAP- eligible, non-participant households are thus identified as households with income less than 130% of the poverty line that were not participating in SNAP during the survey period; within FoodAPS, there are 681 SNAP-eligible, non-participant households. In total, this study's final sample consisted of 1,997 SNAP-eligible households.

Dependent Variables
Expenditures on the following four categories of SNAP restricted items were calculated for each household in the sample: (1) food from SNAP unauthorized retailers (2) alcohol,

Table 1. Descriptive Statistics of Sample by SNAP Participation Status

	SNAP Participants (N=1,316)	SNAP Eligible, Non-Participants (N=681)
Gender		
Female (%)	0.80	0.69***
Male (%)	0.20	0.31***
Income ($/month)	2,050.10	1,313.08***
Household Composition		
Age < 5 (#)	0.42	0.24***
Age 5-17 (#)	0.92	0.63***
Age 18-59 (#)	1.83	1.56***
Age 60+ (#)	0.29	0.37***
Race/Ethnicity		
Non-Hispanic White(%)	0.50	0.46***
Non-Hispanic Black (%)	0.20	0.24
Hispanic (%)	0.24	0.22
Other Race (%)	0.06	0.08**
Education		
High School or Less (%)	0.61	0.56**
Some College (%)	0.31	0.29
BA or Higher (%)	0.08	0.15***
Marital Status		
Married (%)	0.27	0.33***
Other (%)	0.73	0.67***
Region		
Northeast (%)	0.14	0.11*
Midwest (%)	0.17	0.25***
South (%)	0.45	0.40***
West (%)	0.24	0.24
Urbanicity		
Rural (%)	0.26	0.25
Urban (%)	0.74	0.75
WIC	0.19	0.10***
Participant (%)	0.19	0.10***
Non-Participant (%)	0.81	0.90***
Distance to SNAP SS (miles)	2.55	2.44
Vehicle		
Own or Lease (%)	0.72	0.76*
No Vehicle (%)	0.28	.24*
Employment Status		
Employed (%)	0.30	0.34*
Unemployed (%)	0.70	0.66*

*P < 0.10; ** P < 0.05, **P<0.01

(3) hot foods and (4) vitamins and meal supplements. Authorization to accept SNAP benefits requires that food stores meet several eligibility requirements regarding the variety, types and depth of staple food items sold (Oliveira et al. 2018). For each shopping trip, FoodAPS indicates whether the food store households shopped at was authorized to accept SNAP. Thus, SNAP unauthorized retailer expenditures were calculated by summing each household's expenditures at SNAP unauthorized food stores. Note that SNAP unauthorized retailer expenditures are not mutually exclusive from the other SNAP restricted categories in that they include households' expenditures on alcohol, hot foods and vitamins and meal supplements purchased at SNAP unauthorized retailers.

Within FoodAPS, food and beverage purchases are categorized using the USDA ERS' food group classification system. Consisting of 78 food groups, this classification system is used to identify all alcohol, hot food and vitamin and meal supplement purchases made at food stores. Alcohol expenditures are calculated by adding households' expenditures on food group 70305 'Alcohol'. Food group 60101 'ready-to-eat prepared meals' is the base food group used to identify hot food expenditures. From this base food group, hot food items were identified on a case-by-case basis using product/item descriptions and USDA main food code descriptions. Expenditures on identified hot foods were then summed for each household to obtain total hot food expenditures. Household expenditures on vitamins and meal supplements are calculated by adding their expenditures on food group 70601 'vitamins and meal supplements'.

Control Variables
Questionnaires administered pre and psot completion of the FoodAPS diary characterize a wide range of socio-demographic factors for each household. Detailed in Table 1, there is significant heterogeneity in the socio-demographic composition of SNAP households and SNAP-eligible, non-participant households. Relative to non-participant households, SNAP households are less likely to have a male primary survey respondent, a college degree, be employed, be married, own or lease a vehicle and live in the Midwest. Further, SNAP households have larger monthly income and household size, and are more likely to be non-Hispanic White, live in the South or Northeast and participate in WIC. Because SNAP restricted expenditures likely vary across different socio-demographic groups, this analysis includes a range of socio-demographic control variables. Control variables included in Equation 1 include gender, income, household composition by age, race, education, marital status, region, rural, WIC participation, distance to the nearest SNAP superstore, vehicle access and employment status.

Instrumental Variables
In addition to FoodAPS, instrumental variables for SNAP participation are obtained from the USDA's SNAP Policy Database (USDA 2018a). Following Rigdon et al. (2017), the following state-level SNAP policy instruments are obtained: the state (1) operates call centers, (2) offers combined SNAP and SSI application, (3) offers SNAP telephone interviews at initial certification without proof of hardship, (4) offers SNAP telephone interviews at recertification without proof of hardship, (5) disqualifies SNAP applicants/recipients that do not perform the actions required by other means-tested

Table 2. SNAP Restricted Expenditures by SNAP Participation Status

	SNAP Participants (N=1,316)		SNAP Eligible, Non-Participants (N=681)	
	Mean	**Std. Error**	**Mean**	**Std. Error**
SNAP Unauthorized Retailers				
Share Purchasing (%)	31.00	1.28	28.48	1.82
Expenditures ($)	6.94	0.74	4.56**	0.52
Alcohol				
Share Purchasing (%)	7.83	0.74	7.77	1.08
Expenditures ($)	1.01	0.14	1.43	0.33
Hot Foods				
Share Purchasing (%)	19.68	1.1	15.05**	1.44
Expenditures ($)	1.52	0.16	1.26	0.18
Vitamins and Meal Supplements				
Share Purchasing (%)	3.57	0.51	2.75	0.66
Expenditures ($)	0.39	0.08	0.17*	0.05

*$P < 0.10$; ** $P < 0.05$, **$P<0.01$

programs, (6) requires fingerprinting of SNAP applicants, (7) offers online SNAP application, (8) offers simplified reporting option for households with earnings and (9) excludes vehicles from the SNAP asset test. The instruments are linked to households in FoodAPS based on each household's state of residence, as well as the month and year the household completed the FoodAPS survey.

Results

Descriptive Statistics
Descriptive statistics are provided for each category of SNAP restricted expenditures in Table 2. Mean comparison test results are further presented in Table 2 as an indicator of whether there is significant variation in SNAP restricted expenditures by SNAP participation status. Overall, results suggest that SNAP households are more likely to purchase hot foods than eligible, non-participants, and that SNAP households have higher average SNAP unauthorized retailer and vitamin/meal supplement expenditures. Approximately 31% and 29% of SNAP eligible participants and non-participants purchased food and/or beverage items from SNAP unauthorized retailers respectively.

Average expenditures at SNAP unauthorized retailers were significantly higher among SNAP participants at $6.94 versus $4.56 among eligible, non-participants. The share of households purchasing alcohol and average expenditures on alcohol were similar across both groups. SNAP households were 4.63 percentage points more likely to purchase hot foods than eligible, non-participants. However, SNAP participants' expenditures on hot foods did not differ significantly from those of non-participants. Despite similar

probabilities of purchase, SNAP households' average expenditures on vitamins and meal supplements were more than double that of non-participant households. While mean comparison test results indicate significant variation in SNAP restricted expenditures, it is important to note that the results presented in Table 2 do not control for socio-demographic differences among participants and non-participants or control for the potential endogeneity of SNAP participation.

Lognormal Double-Hurdle Model Estimates
Preliminary estimates of the lognormal-double hurdle models for each of the four categories of SNAP restricted expenditures (SNAP unauthorized retailer, alcohol, hot foods and vitamins and meal supplements) are presented in Table 3. Note that the residuals from the control function for SNAP participation were not included as explanatory variables in the lognormal double-hurdle models presented in Table 3. Lognormal-double hurdle models estimates obtained using an instrumental variables approach will be added to a later draft of this manuscript.

Results indicate that after controlling for socio-demographic characteristics, participation in SNAP does not significantly affect households' expenditures on any of the categories of SNAP restricted food and beverages. Thus, variation in current SNAP restricted expenditures among SNAP households relative to eligible non-participants appears to be the result of socio-demographic heterogeneity, as opposed to participation in SNAP.

Estimates indicate that socio-demographic determinants of purchasing food and/or beverages at SNAP unauthorized retailers include household income, household composition, SNAP retailer access, participation in WIC and geographic region. Monthly household income and the number of households members aged 5-17 and 18-59 are positively associated with the probability of shopping at SNAP unauthorized retailers. Further, households who live further from a SNAP authorized superstore are more likely to shop at SNAP unauthorized retailers. In contrast, households living in the West are less likely to make a purchase at a SNAP unauthorized retailer than those in the South. Given purchase, SNAP unauthorized retailer expenditures are higher among households participating in WIC and with members aged greater than 60. However, given purchase, SNAP unauthorized retailer expenditures are lower among households located in the Midwest relative to the South.

The probability of purchasing alcohol is higher among households with a male primary survey respondent, as well as among those with higher monthly income, additional members aged 18-59 and living in the West (relative to the South). Additional household members aged 5-17, living in the Midwest and distance to the nearest SNAP superstore are inversely related to purchasing alcohol. In contrast with the probability of purchasing alcohol, there is no significant variation in alcohol expenditures across socio-demographic groups. This indicates that that there is limited variation in alcohol expenditures across socio-demographic groups given the decision to purchase alcohol.

Similar to alcohol expenditures, variation in hot food expenditures is primarily attributable to the purchase decision. Given purchase, there is no significant relationship

Table 3. Lognoromal Double-Hurdle Model Results

	SNAP Unauthorized Retailers		Alcohol		Hot Foods		Vitamins/Meal Supplements	
	Prob.	Exp.	Prob.	Exp.	Prob.	Exp.	Prob.	Exp.
SNAP	-0.04	0.08	0.02	-0.34	0.11	-0.11	0.18	0.58
Female	0.07	-0.31	-0.23**	2.89	0.05	-0.02	0.24	0.84
Income	3.74E-05*	-1.52E-04	5.12E-05**	-4.34E-04	-5.75E-06	-1.63E-05	-8.49E-06	1.41E-04
Age < 5	0.09	-0.26	-0.04	0.75	0.13**	-0.07	0.14	0.13
Age 5-17	0.07***	-0.17	-0.07*	0.62	0.08**	0.02	-0.04	0.28
Age 18-59	0.13***	-0.33	0.07*	-0.52	0.08**	0.08	0.03	0.03
Age 60+	0.01	0.24**	-0.10	0.69	0.01	0.08	0.17*	0.54
Non-Hispanic Black	-0.05	-0.02	-0.07	0.27	-0.01	-0.06	-1.09***	-0.68
Hispanic	0.12	-0.40	0.03	-0.63	0.08	0.03	-0.12	0.23
Other Race	-0.02	0.08	-0.02	-0.06	0.20	0.03	-0.26*	-0.64
Some College	0.10	-0.24	0.15	-1.25	0.12	-0.27	0.08	0.34
BA or Higher	-0.17	0.85	0.15	-1.12	0.05	-0.16	0.45***	1.17
Married	0.04	-0.38*	0.12	-0.95	-0.04	-0.13	0.01	-0.35
Northeast	-0.02	0.12	-0.09	0.91	-0.13	-0.15	0.01	0.71
Midwest	0.04	-0.48***	-0.22*	1.84	-0.28***	0.08	0.09	1.05
West	-0.22***	0.53	0.21**	-1.52	-0.17**	-0.08	0.12	0.79
Rural	-0.03	-0.05	-0.05	0.49	-0.15	0.01	0.04	0.61
WIC	-0.08	0.53*	-0.19	1.11	0.07	-0.02	3.65E-03	-0.06
SNAP SS Distance	0.02**	-0.06	-0.03*	0.31	-9.01E-04	-0.01	-0.01	-2.61E-03
Vehicle	-0.03	0.06	0.14	-1.24	0.12	-0.10	0.12	0.81
Employed	-0.01	-0.04	0.05	-0.66	0.07	-0.14	0.19	-0.22
IMR	---	-5.22	---	-10.39	---	-0.20	---	1.25
Constant	-0.94***	9.71	-1.51***	22.45	-1.33***	2.22	-2.42***	-4.29

*$P < 0.10$; ** $P < 0.05$, **$P<0.01$

Prob: probability; Exp: expenditure; IMR: inverse mills ratio; SS: superstore

between any of the control variables and expenditures on hot foods. However, the probability of purchasing hot foods increases as the number of household members aged less than 5, 5-17 and 18-59 increases. Further, households living in the Midwest and West are less likely to purchase hot foods than those in the South.

Results for vitamins and meal supplements largely mirror those of alcohol and hot foods. The lognormal double-hurdle model estimates again suggest that there is limited variation in expenditures on vitamins and meal supplements across socio-demographic groups given the households' decision to purchase the items. There is however significant variation in the probability of purchasing vitamins and meal supplements across socio-demographic groups. Households in which the primary survey respondent is Non-Hispanic Black or other races are less likely to purchase vitamins and meal supplements than households with a non-Hispanic White primary survey respondent. Results also indicate that households with a college educated primary respondent are more likely to purchase vitamins and meal supplements than those with a high school degree or less.

Discussion

The objective of this study was to provide insight on the potential impact of proposed SNAP purchase restrictions, by comparing SNAP eligible participant and non-participants' expenditures on current SNAP restricted items i.e. alcohol, hot foods, vitamins/meal supplements and SNAP unauthorized retailer purchases. Preliminary

results indicate that, after controlling for socio-demographic heterogeneity, participation in SNAP does not significantly affect households' expenditures on current SNAP restricted food and beverages. These results provide further evidence that proposed SNAP restrictions on sugar-sweetened beverages and snack foods are unlikely to affect SNAP households' food purchases.

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