The Relationship Between Low-Skilled Unemployment Rates and SNAP Participation

By Catlin N. Nchako

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Abstract

The Supplemental Nutrition Assistance Program (SNAP) is designed to operate counter-cyclically, with participation rising as the economy contracts. The growth in program costs and participation has raised political concerns over whether the program serves truly needy individuals. This study tests the sensitivity of SNAP participation to the unemployment rates of low-skilled individuals, and shows a statistically significant, positive, yet reasonably small correlation. This analysis also finds that the increase in participation becomes larger as unemployment rises and lags behind unemployment. These results suggest the need for caution among policymakers in reaching hasty conclusions about the utility of the program.

I. INTRODUCTION

The Supplemental Nutrition Assistance Program (SNAP), formerly called the Food Stamp Program (FSP), provides benefits to low-income individuals to enable them to purchase food.[1] SNAP is administered by the United States Department of Agriculture (USDA). In an average month in 2012, it served 46.6 million people (USDA 2013). SNAP plays a critical role in reducing poverty; if SNAP benefits were counted in the official poverty measure in 2010, they would have lifted 3.9 million people out of poverty (USDA 2012).

Despite its positive attributes, there is nonetheless a political debate over whether the program contributes to dependence on government welfare. As federal spending on SNAP totaled $80 billion in 2012 (US Dept. of the Treasury 2012), the cost effectiveness of the program has been called into question, in light of the tight fiscal climate. Before the 2008 Farm Bill expired in September 2012, Congress debated the amount of funding to cut from SNAP in a new Farm Bill. The proposed Senate and House bills reduced funding by $4.5 billion and $16.5 billion, respectively (Nixon 2012). The legislation stalled and, one year later, no compromise has been found. New Senate and House bills proposed in the second half of 2013 feature funding cuts of $4.5 billion and $40 billion, respectively (Steinhauer 2012; Nixon 2013). As of November

2013, a joint conference committee is negotiating on a final bill.

These debates reflect a basic question: To what extent should the US government provide assistance to low-income citizens? Advocates for more assistance often argue that it relieves low-income individuals of the all-consuming effort to meet their basic needs, enabling them to focus on improving their economic condition. They contend that SNAP has served as a much-needed cushion during the economic recovery, and that the rise in the program's costs reflects the growth in economic need during the 2007–2009 recession (Center on Budget and Policy Priorities 2012). In contrast, proponents for less government assistance believe that the social safety net is bloated and robs the recipients of the incentive to work. They argue that funding cuts will root out long-term dependence on government welfare by serving only those who are legitimately in need (Rector 2012).

This paper contributes to this debate by analyzing how changes in the unemployment rate of individuals without a high school degree affect the number of individuals who participate in SNAP. The goal of this study is to test the sensitivity of SNAP participation to changes in the unemployment rates of a group that is likely to be economically vulnerable.[2] If SNAP participation

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[1] The 2008 Farm Bill changed the name of the Food Stamp Program (FSP) to the Supplemental Nutrition Assistance Program (SNAP), effective as of October 2008.

[2] Workers with no more than a high school education held nearly four out of every five jobs lost during the 2007 – 2009 recession, and employment among this group has declined since 1989 (Carnevale et al. 2012). The median weekly wage in 2012 for full-time workers in this group was $471 (US Bureau of Labor Statistics

were unaffected by unemployment, this would suggest that recipients take advantage of the program's benefits regardless of their employment circumstances, and that SNAP is not providing benefits primarily to individuals in need. In contrast, if SNAP participation were sensitive to unemployment, this would suggest that recipients' use of the program varies with their level of economic need and that the program is performing as designed.

To answer this research question, I combine annual data on aggregated state totals of the number of SNAP participants with annual data on state-level unemployment rates of the segment of the US population that did not graduate from high school. While previous research has examined the relationship between SNAP participation and state unemployment rates, there appears to be no other study that has directly tested how SNAP participation is affected by changes in the unemployment rates of a disadvantaged group. This analysis fills that void, using individuals without a high school degree as the disadvantaged group of interest. The term "low-skilled population" is used hereafter to refer to this group.

II. BACKGROUND

SNAP and its predecessor, FSP, are means-tested programs that have

provided benefits to low-income individuals for over 40 years. To be eligible for benefits, households must have monthly gross and net incomes below 130 percent and 100 percent, respectively, of the poverty line.[3] They must also have less than $2,000 in assets, or less than $3,250 if they include an elderly or disabled member. Benefits decrease by 30 cents for each additional dollar in net income (Tiehen et al. 2012).

SNAP reaches many segments of the US population that are vulnerable to economic downturns. In fiscal year 2011, 76 percent of SNAP households contained children, elderly or disabled individuals. Forty-seven percent of all SNAP households included children; of this group, 56 percent were headed by single parents. Eighty-three percent of SNAP households had incomes below the federal poverty level. SNAP recipients also take advantage of other public assistance programs: during the same year, eight percent of SNAP households received cash assistance from the Temporary Assistance for Needy Families (TANF) program (Strayer et al. 2012).[4]

2012). On an annualized basis, these wages are slightly more than double the 2012 federal poverty level for a household of one. These data provide evidence that this group is likely to be economically disadvantaged.

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[3] Net income is defined as gross income minus several deductions allowed under SNAP program rules: a standard deduction; deductions for earned income, for child care expenses, for medical care for elderly or disabled dependents, for legally owed child support payments, and for shelter costs in excess of half of the household's income after the other deductions are applied (US Dept. of Agriculture 2012).
[4] In contrast, nearly 98 percent of all households that participated in the Temporary Assistance for Needy Families program obtained SNAP benefits in fiscal year 2010 (Eslami et al. 2012).

The growth in SNAP expenditures and participation has fueled the ongoing Congressional disagreement over the program's funding. Federal spending on SNAP has increased from $34 billion in 2007 to $80 billion in 2012 (Congressional Budget Office 2012). The average monthly household benefit in 2011 was $284, up from $215 in 2007 (USDA FNS Program Data 2012). Between 2007 and 2011, the national unemployment rate rose from 4.6 percent to 8.9 percent, and the number of SNAP participants increased from some 26 million to nearly 45 million individuals (US Bureau of Labor Statistics 2012; Congressional Budget Office 2012).

SNAP is intended to work as a counter-cyclical program. In theory, participation in the program should rise when employment declines and decrease as employment increases. This study examines whether SNAP is, in fact, operating as designed by analyzing how well the program responds to changes in unemployment for an economically vulnerable group, namely, the segment of the US population without a high school degree.

III. LITERATURE REVIEW

Previous studies of FSP and SNAP have consistently found that changes in the economy have an impact on participation. Quantifying this effect has been a central challenge for researchers due to the concurrent influence of changing FSP and SNAP eligibility rules on program participation. Using fixed effects

analyses, the studies cited in the following literature review highlight previous findings on the effects of the economy and of SNAP policies on SNAP participation.

The Impact of the Economy on FSP and SNAP Participation Rates

Most of the literature confirms that the program responds counter-cyclically to economic changes. Previous research has found a positive correlation between state unemployment rates and food stamp caseloads between 1980 and 1999 (Ziliak et al. 2003), and between 1989 and 2004 (Danielson and Klerman 2006). It has also found a positive relationship between state unemployment rates and the number of FSP-eligible individuals between 2000 and 2006 (Mabli et al. 2009). Additionally, previous research has demonstrated both positive contemporaneous and lagged relationships between state unemployment rates and FSP and SNAP caseloads between 1989 and 2009 (Klerman and Danielson 2011), and has found that the positive impact of state unemployment on food stamp caseloads per capita increased after welfare reform in 1996 (Bitler and Hoynes 2010).

The Impact of FSP and SNAP Policies on Participation

The difficulty in assessing the impact of the economy on participation lies in separating such effects from those of FSP and SNAP policy changes on participation. Various FSP- and

SNAP-related policies have been established over the past two decades. In 1996, as the economy expanded after the 1990–1991 recession, welfare reform legislation reduced FSP benefit levels, set time limits for benefit receipt for adults without disabilities in childless households, and denied FSP eligibility to many legal immigrants (Congressional Budget Office 2012). In 2001, many states eased the requirements in income reporting and in counting assets to determine benefit eligibility (USDA 2003). The 2002 Farm Bill reinstated FSP eligibility for certain types of immigrants and funded state efforts to encourage SNAP participation (Mabli et al. 2009). It also provided transitional benefits to families who moved off of welfare (USDA 2003). Subsequently, the 2008 Farm Bill increased the program's deductions in order to facilitate participation (Andrews 2012), and the 2009 American Recovery and Reinvestment Act temporarily raised the maximum monthly benefit (Congressional Budget Office 2012).

According to existing research, the adoption of these FSP and SNAP policies may have had a separate effect from the economy on food stamp participation. Ratcliffe et al. (2008) find a positive relationship between FSP participation between 1996 and 2003 and the exemption of vehicles from asset limits, a conclusion that contradicts a previous study by Hanratty (2006) that found no such significant relationship. Mabli et al. (2009) find that simplified reporting and expanded categorical eligibility

were positively associated with the FSP caseload growth between 2000 and 2006. They also find no significant association between participation and the availability of outreach expenditures. Conversely, Mabli and Ferrerosa (2010) find that the availability of outreach spending is positively correlated with SNAP caseloads for the elderly-only, adult-only, and poorest households, between 2000 and 2008.

Demography and SNAP Participation

Previous studies also accounted for demographic factors in their analyses of SNAP participation. However, the specific demographic measure used varies from study to study. Researchers have included controls for the share of the population within specific age categories (Danielson and Klerman 2006; Klerman and Danielson 2011), family characteristics (Hanratty 2006), household composition (Ratcliffe et al. 2008), the share of non-citizens in the population (Mabli and Ferrerosa 2010), and the presence of single-female headed households (Bitler and Hoynes 2010).

Implications for this Study

Thus, the existing literature confirms that there is a relationship between SNAP participation and unemployment that may be confounded by other factors impacting participation. While previous studies have used overall state unemployment rates as a measure of economic changes, this measure does not offer a precise picture

of the responsiveness of SNAP to unemployment among an economically vulnerable group. General state unemployment rates measure the economic conditions of individuals regardless of their eligibility for SNAP benefits or their likelihood to ever use the program. This approach makes these general unemployment rates a less perfect measure of the economic conditions of those vulnerable individuals who are the intended targets of the SNAP program. To address this gap in the current research and provide a more direct test of the relationship between SNAP and unemployment among such a targeted group, this study uses an alternate measure as its key independent variable, namely, the unemployment rates of low-skilled individuals.

IV. CONCEPTUAL FRAMEWORK

I hypothesize that state-level unemployment rates for the low-skilled population are positively correlated with the number of SNAP participants. As noted in the Literature Review above, economic conditions and the adoption of SNAP policies affect SNAP participation. Differences between states in the adoption of SNAP policies may contribute to changes in SNAP participation. This impact may be separate from the effect of changes in the economy on participation. My model also accounts for the influence of changes in the demographic composition of state populations on participation. These factors are diagrammed in Figure 1 below.

Demographic Composition

SNAP households participate in the program at different rates depending on their composition. The poorest households are most likely to participate in the program (Congressional Budget Office 2012). Similarly, households with children or that receive TANF benefits also participate at high rates. Households that include the elderly, immigrants, childless non-disabled adults, or that receive earnings participate at lower rates (Leftin et al. 2011).

Adoption of SNAP Policies

Federal regulations enable states to adopt optional policies intended to expand eligibility, encourage participation, and streamline FSP operations at the state level (Andrews 2012). The following policy options directly impact the accessibility of benefits (USDA 2012) and have been recognized in previous research:
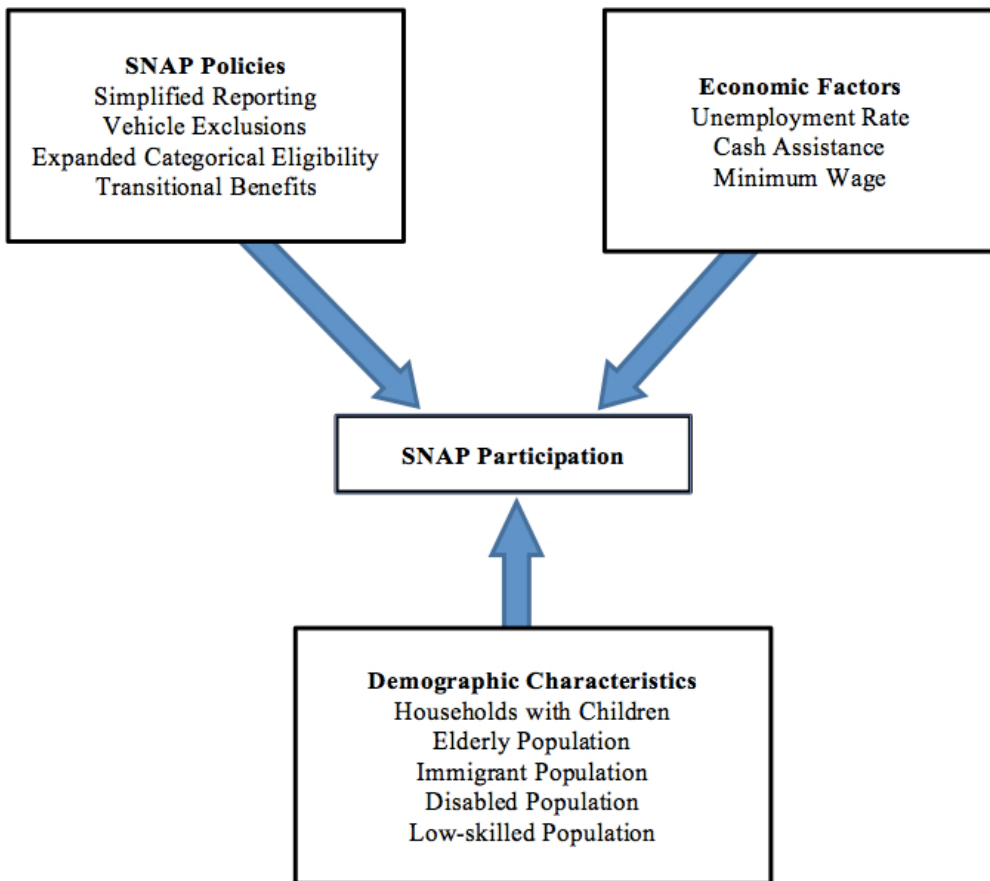
Simplified Reporting
This option enables states to simplify the reporting of household income and to lengthen certification periods, making it easier for households to

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[5] In addition to the policies listed in Figure 1, changes in SNAP benefit levels also plausibly affect SNAP participation. The 2008 Farm Bill raised benefits by increasing the standard and child care deductions, raising the minimum benefit levels, and indexing the benefits to inflation (Andrews 2012). The 2009 American Recovery and Reinvestment Act raised the maximum benefit levels and suspended time limits for benefit receipt among childless non-disabled adults (Leftin et al. 2011). SNAP benefit levels are not listed in the Figure 1 because they are set at the federal level and apply uniformly to all states, so they are captured under state and year fixed effects.

Figure 1. Conceptual Framework of the Factors that Affect SNAP Participation[5]

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┌─────────────────────────────┐        ┌─────────────────────────────┐
│      SNAP Policies          │        │     Economic Factors        │
│    Simplified Reporting     │        │     Unemployment Rate       │
│     Vehicle Exclusions      │        │      Cash Assistance        │
│ Expanded Categorical        │        │       Minimum Wage          │
│        Eligibility          │        │                             │
│   Transitional Benefits     │        │                             │
└─────────────────────────────┘        └─────────────────────────────┘
                  ↘                          ↙
                     ┌──────────────────────┐
                     │   SNAP Participation  │
                     └──────────────────────┘
                                ↑
              ┌─────────────────────────────────┐
              │   Demographic Characteristics   │
              │    Households with Children     │
              │       Elderly Population        │
              │      Immigrant Population       │
              │       Disabled Population       │
              │     Low-skilled Population      │
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receive benefits (Mabli and Ferrerosa 2010).[6] By 2011, 50 states had implemented this policy, up from 33 in 2003 (USDA 2012; Andrews 2012).

Vehicle Exclusions
This option enables states to exclude vehicles in the counting of assets when determining household eligibility for SNAP benefits. By 2005, 25 states excluded all vehicles from these asset limit tests (USDA 2005). By 2011, 35

states had implemented this exclusion (USDA 2012).

Expanded Categorical Eligibility
Under this option, households that participate in certain public assistance programs automatically qualify for SNAP benefits. In addition, categorically eligible households are not subject to asset tests (Congressional Budget Office 2012). In 2011, 42 states had implemented this policy, up from nine in 2002 (USDA 2012; Andrews 2012).

Transitional Benefits
Under this option, households that are leaving the TANF program can obtain

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[6] SNAP households with shorter certification periods are required to report changes in their financial circumstances to state agencies more frequently in order to continue receiving SNAP benefits (Mabli and Ferrerosa 2010).

temporary SNAP benefits. In 2011, 20 states provided this benefit, up from 15 in 2005 (USDA 2012; USDA 2005).

V. DATA & METHODS

Data on state unemployment rates, economic factors, and demographic characteristics of the US population were collected from the US Census Bureau's American Community Survey (ACS) 1-year series. My analysis is restricted to the years between 2005, when the ACS was fully implemented, and 2011, the most recent year for which data are available (US Census Bureau 2009). State SNAP participation data were obtained from the USDA Food and Nutrition Service (FNS) Annual State Level Program Data for the fiscal years 2007–2011 and from the USDA 2006 and 2005 State Activity Reports.[7] Information on SNAP policies was obtained from the USDA FNS SNAP State Options Reports, corresponding to the years 2005–2007 and 2009–2011.[8]

I estimate a fixed effects regression model to analyze the relationship between the unemployment rates of the low-skilled population and SNAP participation. My specification controls for differences between states that are correlated with SNAP participation and unemployment rates as well as differences that do not change over time. Year fixed effects also control for characteristics that vary over time, that are common to all states, and that are correlated with SNAP participation and unemployment rates. The unit of analysis is the state-year.

The model specification is as follows:

$$Foodstamp_{it} = \beta_0 + \beta_1 unemployedlowskill_{it} + \beta_2 lowskilled_{it} + \beta_3 householdchild_{it} + \beta_4 elderly_{it} + \beta_5 immigrant_{it} + \beta_6 disabled_{it} + \beta_7 cashassistance_{it} + \beta_8 minimumwage_{it} + \beta_9 simplifiedreporting_{it} + \beta_{10} transitionalbenefit_{it} + \beta_{11} categoricaleligibility_{it} + \beta_{12} vehicle_{it} + \alpha_i + \gamma_t + \mu_{it}$$

where i represents the state index, t is the year index, α_i represents state time-invariant characteristics, γ_t represents dummy variables for each year, and μ_{it} is the error term. The initial sample size for the combined data set is 357 observations (51* 7).[9] Due to missing values in the dataset for some variables in the regression model, my final sample size is 342 observations. The model includes control variables for the demographic characteristics of state populations, economic factors that may affect participation other than low-skilled unemployment, and the

[7] The Annual State Level Program Data are provided for the last five completed fiscal years and are subject to revision. The data used in this study were obtained from USDA Program Data that were revised as of November 9, 2012. USDA FNS Program Data and USDA State Activity Reports are available online at http://www.fns.usda.gov/pd/SNAPmain.htm.

[8] USDA FNS SNAP State Options Reports can be found at http://www.fns.usda.gov/snap/government/Policy.htm. No State Options Report was published for the year 2008, when the 2008 Farm Bill introduced SNAP policy changes. In footnote 11, I explain how I handle this issue so that data for these years can be included. Policy data for these years are imputed in my study under the assumption that the states carried out the same SNAP policies implemented in the previous year for which data are available.

[9] Fifty states and the District of Columbia.

SNAP policy options adopted by states over the period under study. Table 1 provides definitions for all of the variables.

VI. DESCRIPTIVE STATISTICS

Tables 2 and 3 provide descriptive statistics for the dependent and key independent variables, state demographic characteristics, economic factors and policy controls. Table 2 shows that there is substantial variation in the sample in the number of SNAP participants per capita in an average month, ranging from a minimum of 4,111 participants per 100,000 people in a state to a maximum of 21,820 participants per 100,000 people in a state. The average monthly number of SNAP participants per 100,000 people in a state was 10,649. The average unemployment rate of individuals between 25 and 64 years of age without a high school degree was about 13 percent across states, and unemployment within this group ranged from 3.5 percent to 29.9 percent.[10]

Table 3 shows that the share of states—including the District of Columbia—that have adopted the policies defined in the Conceptual Framework section have increased between 2005 and 2011.[11]

available for fiscal year 2008 as of this writing. Missing 2008 data for these variables were imputed when there were data available for 2007 and 2009 under the assumption that, if the policy was adopted in both of these years, it was also adopted in 2008. Similarly, if the policy was not adopted in both of those years it was assumed not to have been adopted in 2008. Missing 2008 data for these variables were not imputed if the policy was adopted in one year but not in the other year. Other than the policy options, there were no other missing values in the dataset. The original dataset contained 18 variables, with 357 state-year observations (51*7), for a total of 6,426 data points. Some 51 observations did not have data for the four policy variables, for a total of 204 missing values, or about three percent of the data points. Using the above-mentioned assumptions, values were imputed for 187 of the 204 missing data points. Values could not be imputed for some 15 observations. Consequently, these observations were dropped, resulting in a final sample size of 342 observations. A preliminary fixed effects analysis using all data and only non-imputed data indicates that the estimated effect of unemployment among low-skilled individuals on SNAP participation per capita is not sensitive to the inclusion of imputed data in the SNAP policy variables. The key coefficient of interest remains positive and statistically significant whether the regression uses imputed or non-imputed data. Moreover, a series of t-tests show that there are no statistically significant differences in the demographic and economic characteristics between observations for which simplified reporting, transitional benefits, vehicle exclusion, or categorical eligibility data were imputed and observations for which these data were not imputed, except for one control variable: the percentage of the population that is disabled. Although this may bias the coefficient for this control variable, this is not a concern because its effect on SNAP participation is not the main focus on this study.

[10] In comparison, the US annual average unemployment rate in 2011 for the nationwide population 16 years and older was 8.9 percent (US Bureau of Labor Statistics 2012).

[11] Data on the state adoption of the four SNAP policies of interest (simplified reporting, transitional benefits, vehicle exclusion, and expanded categorical eligibility) were not

Table 1. Variable Definitions

Variables	Definitions
Dependent Variable	
Foodstamp	This continuous variable measures the average monthly number of SNAP participants per 100,000 people in a state. The USDA defines SNAP participation for a given year as the number of SNAP participants in an average month of that year. Monthly totals of SNAP participants are obtained from states, summed and divided by twelve (USDA 2012). These estimates were obtained from the USDA FNS Program Data and converted into per capita measures using population data from the ACS.
Independent Variable of Interest	
Unemployedlowskill	This continuous variable measures the unemployment rate of the segment of the state population between 25 and 64 years old without a high school degree. These data are gathered from the ACS.
Demographic Characteristics	
Lowskilled	This continuous variable measures the percentage of the state population aged 25 and older without a high school degree. These data are gathered from the ACS.
Householdchild	This continuous variable measures the percentage of households in a state that contain families with children under the age of 18. These data are gathered from the ACS.
Elderly	This continuous variable measures the percentage of the state population that is 65 years and older. These data are gathered from the ACS.
Immigrant	This continuous variable measures the percentage of the state population that is foreign-born and does not have U.S. citizenship. These data are gathered from the ACS.
Disabled	For the years 2005, 2006 and 2007, this continuous variable measures the percentage of the state civilian population five years and older that is disabled. For 2008, 2009, 2010, and 2011, this variable measures the percentage of the total civilian non-institutionalized population that is disabled. These data are gathered from the ACS.
Economic Characteristics	
Cashassistance	This continuous variable measures the percentage of households in a state that received cash assistance from the TANF and General Assistance programs during the 12 months prior to the day of the survey interview (US Census Bureau 2012). These data are gathered from the ACS.
Minimumwage	This continuous variable measures the state minimum wage. The federal minimum wage prevails in states with no state minimum wage. The minimum wages are adjusted for inflation and expressed in 2011 dollars using the annual Consumer Price Index for All Urban Consumers. These data are gathered from the US Census Bureau.
Policy Options	
Simplifiedreporting	This dichotomous variable indicates whether or not a state has implemented simplified reporting in a given year. These data are gathered from the USDA.
Transitionalbenefit	This dichotomous variable indicates whether or not a state has implemented transitional benefits in a given year. These data are gathered from the USDA.
Categoricaleligibility	This dichotomous variable indicates whether or not a state has implemented expanded categorical eligibility in a given year. These data are gathered from the USDA.
Vehicle	This dichotomous variable indicates whether or not a state opted to exclude all vehicles from the counting of assets when determining a household's eligibility for SNAP benefits in a given year. These data are gathered from the USDA.

Table 2. Descriptive Statistics for Dependent, Key Independent, and Control Variables				
Variables	Mean	Minimum	Maximum	Standard Deviation
Average Number of SNAP Participants per Month per 100,000 people in a State	10,649	4,111	21,820	3,723
Unemployment Rate of Low-Skilled Population	12.96	3.5	29.9	4.27
Demographic Characteristics				
Percentage of Population without High School Degree	15.11	7.7	22.1	3.49
Percentage of Households with Children	30.71	16.7	40.3	2.7
Percentage of Population that is Elderly	12.7	6.6	17.6	1.83
Percentage of Population that is Immigrant	0.07	0	0.16	0.04
Percentage of Population that is Disabled	13.36	8.5	23.7	2.55
Economic Factors				
Percentage of Households on Cash Assistance	2.56	1.1	6.7	0.83
Minimum Wage (2011 Dollars)	7.02	2.77	8.96	0.99
N = 342				

Table 3. Descriptive Statistics for SNAP Policy Adoption Indicators*							
	Percent of States and the District of Columbia that Adopted SNAP Policies						
SNAP Policy	2005	2006	2007	2008	2009	2010	2011
Simplified Reporting	86%	90%	92%	94%	94%	96%	98%
Vehicle Exclusion from Asset Test	49%	51%	57%	67%	73%	67%	69%
Expanded Categorical Eligibility	76%	73%	69%	77%	78%	88%	82%
Transitional Benefits	29%	33%	35%	36%	37%	41%	39%
N = 342							

For each policy, the percentages indicate the share of all 50 states and the District of Columbia that adopted a given policy for each year in the sample, except for 2008. My analysis for that year excludes the 15 observations in the sample that have incomplete data for the four policy indicators in 2008, even after imputation.

Table 4. Regression Results

Dependent Variable	Number of SNAP participants per 100,000 people in a state				
	(1)	(2)	(3)	(4)	(5)
State and Year Fixed Effects	No	Yes	Yes	Yes	Yes
Key Independent Variable					
Low-skilled Population	366.58***	217.65***	171.32***	157.49***	138.56***
Unemployment Rate	(49.76)	(47.59)	(49.09)	(49.5)	(34.11)
Demographic Variables					
Percent Population without	800.79***		305.67	252.3	270.7
High School Degree	(68.68)		(268.98)	(241.62)	(197.02)
Percent Households	-500.70***		118.63	93.1	45.36
with Children	(90.38)		(180.1)	(165.87)	(176.53)
Percent Population	-361.85***		1,465.85**	1,294.00**	1,243.04**
that is Elderly	(135.3)		(608.15)	(628.93)	(560.62)
Percent Population	-35,033.50***		-15,794.80	-7,264.63	-5,292.90
that is Immigrant	(6,417.37)		(45,623.84)	(45,838.54)	(40,843.43)
Percent Population	-195.40**		-69.79	-104.6	-69.9
that is Disabled	(84.61)		(220.2)	(225.27)	(226.91)
Economic Variables					
Percent Households on	627.35***			566.81	601.92
Cash Assistance	(232.19)			(399.68)	(394.82)
Minimum Wage	2,643.42**			-261.94	-270.55
(logarithm)	(1,144.7)			(727.24)	(670.39)
Policy Variables					
Simplified Reporting	4,023.07***				-1,133.49**
	(602.51)				(494.16)
Transitional Benefits	4.61				318.64
	(296.3)				(249.94)
Vehicle Exclusion	-571.62*				364.76
	(313.92)				(295.34)
Categorical Eligibility	989.79***				-186.12
	(258.45)				(356.73)

VII. RESULTS

The results of my fixed effects analyses are summarized in Tables 4 and 5. Column 1 of Table 4 shows the results of the OLS regression that does not contain fixed effects, while the columns numbered 2 through 5 show the results of the fixed effects analyses in which groups of control variables are cumulatively added to the regression model. Table 5 shows alternative functional form specifications of the main regression model.[12] The

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[12] For all of these regressions, I estimate robust standard errors clustered at the state level to correct for heteroskedasticity and autocorrelation. Furthermore, in these

Table 4 Continued					
	(1)	(2)	(3)	(4)	(5)
Constant	8,300.36*	6,518.63***	-17,025.76	-14,213.00	-12,135.06
	(4,714.21)	(516.83)	(12,053.99)	(11,697.87)	(11,233.25)
Observations	342	342	342	342	342
R-squared	0.749	0.911	0.919	0.921	0.925
F-statistics and p-values of Joint Hypotheses					
Demographic variables			2.06*	1.81	1.96
			(0.086)	(0.129)	(0.101)
Economic variables				1.02	1.24
				(0.368)	(0.298)
Policy variables					3.11**
					(0.023)

Robust standard errors are given in parentheses under coefficients and p-values are given in parenthesis under F-statistics

*** p<0.01, ** p<0.05, * p<0.1

coefficient for the key independent variable indicates the change in the number of SNAP participants per 100,000 people in a state that is associated with a one percentage point increase in the unemployment rate of the low-skilled population, holding constant all factors included in the model.[13]

The key coefficients for the low-skilled unemployment rate, shown in Table 4, indicate a consistently positive and statistically significant relationship between this variable and SNAP participation. As shown in columns 1 through 4, the coefficient for the low-skilled unemployment rate remains positive and statistically significant

across partial model specifications. The full model in column 5, which contains all the control variables and employs fixed effects, shows a statistically significant coefficient of 138.56, indicating that a one percentage point increase in the unemployment rate of the low-skilled population is associated with an increase of about 139 SNAP participants for every 100,000 people in a given state, holding constant state and year fixed effects and the control variables included in the model. The results of the joint significance tests, shown in the bottom panel of Table 4, indicate that the demographic and economic variables may have no effect on SNAP participation. In contrast, as a group, the policy variables may have an effect on SNAP participation.

The results in Table 5 indicate that SNAP participation may have a non-linear relationship with the contemporaneous low-skilled unemployment rate and with the

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regressions the minimum wage is expressed as a logarithm, rather than as the absolute dollar amount shown in Table 2.

[13] In a sensitivity test, I also estimate a version of the regression model that uses the untransformed minimum wage variable as a control. The results of this alternative specification are comparable to those of the main regression model in this study and can be found in the Appendix.

Table 5. Regression Results for Alternative Specifications

Dependent Variable	SNAP participation per 100,000 people in a state							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Key Independent Variable								
Low-skilled	138.56***	-73.15					74.48*	
Unemployment Rate	(34.11)	(75.49)					(40.05)	
Squared Low-skilled		6.99**						
Unemployment Rate		(2.71)						
1-year Lagged			179.03***	-61.02				
Low-skilled Unemployment Rate			(58.56)	(100.02)				
Squared 1-year Lagged				8.01**				
Low-skilled Unemployment Rate				(3.39)				
2-year Lagged Low-skilled					141.80*	-104.79		
Unemployment Rate					(74.76)	(114.02)		
Squared 2-year Lagged						9.04**		
Low-skilled Unemployment Rate						(3.41)		
Low-skilled Unemployment * After 2008							78.81*	
							(45.57)	
Overall State Unemployment Rate								103.69
								(140.39)
Demographic Variables								
Percent Population without	270.7	311.79	303.3	330.33	151.31	146.05	281.44	
High School Degree	(197.02)	(197.35)	(205.73)	(208.04)	(233.53)	(222.4)	(200.09)	
Percent Households with Children	45.36	103	114.2	230.2	-83.97	-19.32	102.46	13.53
	(176.53)	(164.22)	(182.18)	(185.02)	(194.19)	(190.7)	(163.36)	(190.95)

Table 5 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Percent Population that is Elderly	1,243.04**	998.94*	1,185*	945.11	1,083.51	933.63	995.01*	1,487.68**
	(560.62)	(506.47)	(649.12)	(592.57)	(770.08)	(758.89)	(539.55)	(644.41)
Percent Population that is Immigrant	-5,292.90	-17,893.73	3,731	-6,580.23	-14,343.06	-16,226.18	-16,130.45	-6,608.19
	(40,843.43)	(38,514.57)	(43,580.1)	(38,786.51)	(43,264.35)	(39,886.71)	(38,573.36)	(37,639.82)
Percent Population that is Disabled	-69.9	-70.81	-146.5	-144.89	-153.59	-164.33	-50.4	24.47
	(226.91)	(215.58)	(248.51)	(232.62)	(262.55)	(239.4)	(221.05)	(216.83)
Economic Variables								
Percent Households on Cash Assistance	601.92	576.24	614.6	624.96*	604.11	671.35*	581.4	730.63*
	(394.82)	(390.47)	(385.)	(368.26)	(372.49)	(348.78)	(401.77)	(388.04)
Minimum Wage (logarithm)	-270.55	-222.49	-199.7	-130.29	-190.75	-158.73	-163.46	-204.62
	(670.39)	(686.05)	(830.44)	(813.25)	(935.87)	(870.42)	(671.61)	(723.37)
Policy Variables								
Simplified Reporting	-1,133.49**	-1,072.52**	-1,349**	-1,337.65**	-1,978.97**	-1,904.91**	-1,075.01**	-1,057.21*
	(494.16)	(479.27)	(606.71)	(594.61)	(753.98)	(751.06)	(494.36)	(536.36)
Transitional Benefits	318.64	325.02	394.6	451.35	-28.08	203.56	330.05	259.14
	(249.94)	(238.56)	(305.48)	(320.5)	(229.93)	(248.02)	(234.88)	(255.59)
Vehicle Exclusion	364.76	413.79	478.6	623.89**	776.79*	944.27**	407.17	509.68
	(295.34)	(284.27)	(295.23)	(288.63)	(415.79)	(395.02)	(289.15)	(352.29)
Categorical Eligibility	-186.12	-203.6	-257.8	-262.47	-406.83	-359.87	-204.05	-203.17
	(356.73)	(347.28)	(326.87)	(297.46)	(326.12)	(305.89)	(355.18)	(394.98)
Constant	-12,135.06	-9,410.29	-14,472	-13,496.43	-2,230.41	-944.92	-10,155.14	-10,646.55
	(11,233.25)	(10,728.18)	(12,578.42)	(12,048.2)	(14,164.01)	(14,472.77)	(11,092.86)	(12,787.6)
Observations	342	342	291	291	240	240	342	342
R-squared	0.925	0.928	0.934	0.937	0.936	0.939	0.926	0.919

Table 5 Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
F-statistics and p-values of Joint Hypotheses								
Squared and Linear Untransformed Unemployment Rates		8.88*** (0.001)						
1-Year Lagged Squared and Linear Untransformed Unemployment Rates				5.81*** (0.005)				
2-Year Lagged Squared and Linear Untransformed Unemployment Rates						4.76** (0.013)		
Low-skilled Unemployment * After 2008 And Untransformed Unemployment Rate							7.65*** (0.001)	
Inflection point		5.23 (3.652)		3.81 (4.982)		5.79 (4.903)		

Robust standard errors are given in parentheses under coefficients. Standard errors are given in parenthesis under the inflection points. P-values are given in parenthesis under F-statistics

*** p<0.01, ** p<0.05, * p<0.1

low-skilled unemployment rates of the previous two years. Column 1 replicates the full model from column 5 of Table 4. Column 2 shows that the relationship between SNAP participation and the unemployment rate is non-linear. The correlation is initially negative then becomes positive, and the "inflection point" occurs at the imprecisely estimated unemployment rate of 5.2 percent, below the average rate of 13 percent shown in Table 2.[14]

The results from columns 3, 4, 5, and 6 suggest that SNAP participation is correlated with the low-skilled unemployment rate of the previous two years. The relationship between participation and the lagged unemployment rates is non-linear, and the direction of the correlations with the one-year and two-year lagged rates change at the imprecisely estimated rates of 3.8 percent and 5.8 percent, respectively. The results from column 7 suggest that the effect of low-skilled unemployment on SNAP participation was stronger after the 2008 Farm Bill was enacted.[15]

The model in column 8 uses overall state unemployment rates as an alternate key independent variable, in order to examine how the results differ from previous studies,

[14] I also estimated a regression model with a cubed low-skilled unemployment rate. The coefficient for this variable was statistically insignificant at the 10 percent level. The results for this specification are therefore not included here.

[15] The 2007–2009 recession is not mentioned as a potentially confounding factor, because it applied commonly to all states and is therefore captured under state and year fixed effects.

given my choice of a different key independent variable.[16] The results confirm the positive correlation found in the existing literature between state unemployment rates and SNAP participation. However, this relationship is weaker than that found in the full model in column 1, possibly because overall unemployment includes individuals who are unlikely to use SNAP benefits.

Tables 4 and 5 show that the controls are, for the most part, individually statistically insignificant across the different model specifications. One puzzling exception is simplified reporting, which has a consistently negative and statistically significant coefficient in Table 5. This policy is intended to simplify the process of certifying SNAP benefits for recipients and so, in theory, should have a positive impact on SNAP participation. This unexpected finding presents an interesting potential avenue for future research.

In summary, the main regression analyses show that low-skilled unemployment has a non-linear relationship with, and contemporaneous and lagged effects on, SNAP participation. Robustness checks appear in the Appendix, and show that the relationship is consistent across different variations of the main model. These findings confirm the measurable response of SNAP to low-skilled unemployment.

VIII. DISCUSSION

Major Findings

The main regression results confirm my hypothesis that SNAP participation and the state-level unemployment rates of the low-skilled population are positively correlated. As predicted, food stamp participation rises when state-level low-skilled unemployment rates increase. Given that the per capita average number of SNAP participants in the sample, as shown in Table 2, is 10,649 per month for every 100,000 people in a state, the estimated increase of 139 participants represents an increase in average participation of less than two percent. This suggests that an increase in low-skilled unemployment does not, by itself, result in a notable take-up of food stamps by the low-skilled population.

In addition, the relationship between SNAP participation and low-skilled unemployment rates is also non-linear. In an ordered distribution of the low-skilled unemployment rates in the sample, the rate at the 25th percentile is 9.6 percent; the median rate is 11.9 percent; and the rate at the 75th percentile is 16.2 percent. At these three percentiles, the non-linear model predicts that SNAP participation increases in response to a one percentage point increase in the low-skilled unemployment rate by about 61 participants, 93 recipients, and 153 participants, respectively, for every 100,000 people in a state. This indicates that the rate at which low-skilled individuals take up SNAP benefits

[16] State unemployment rates were obtained from the US Bureau of Labor Statistics, available at http://www.bls.gov/lau/.

increases as the contemporaneous unemployment rate of this group rises.

The regression results also indicate that SNAP participation is positively correlated with the low-skilled unemployment rate one and two years prior. This suggests that some low-skilled individuals do not immediately act on the effects of unemployment, even though they may experience them. They may wait a period of time as their savings and other resources dwindle before turning to SNAP for assistance. In addition, the results show that the higher the initial level of the lagged unemployment rates, the greater the increase in SNAP participation in response to changes in low-skilled unemployment in the previous two years.

Finally, the regression results suggest that the effect of low-skilled unemployment was larger after the passage of the 2008 Farm Bill. This may reflect the impact of the 2007–2009 recession during which economic need increased among the population as a whole. It may also reflect the effects of policy changes in the 2008 Farm Bill and the 2009 American Recovery and Reinvestment Act, which expanded eligibility for SNAP benefits. These findings appear to confirm that these legislative changes facilitated an increase in the responsiveness of SNAP to the unmet needs of low-skilled individuals.

Comparison with Previous Literature

The results of my analysis are not directly comparable to the findings of previous research because the model specifications in previous studies use overall state unemployment rates. Nevertheless, the effect of low-skilled unemployment estimated in my analysis is consistent with the findings of other studies that use fixed effects specifications with state-level panel data. Mabli et al. (2009) estimated an increase in the SNAP participant count per capita of four percent for a one percentage point increase in the overall unemployment rate. Klerman and Danielson (2011) and Bitler and Hoynes (2010) estimated an increase in SNAP caseloads of about four percent and nearly five percent, respectively. My results are consistent with the signs of the coefficients estimated in those studies.

Since my analysis uses the unemployment rates of a group that is likely to use SNAP, it is conceivable that the effect of low-skilled unemployment would be at least as strong as that found in studies that use overall unemployment rates. In order to determine this, I use the coefficients from the two studies by Mabli et al. (2009) and Mabli and Ferrerosa (2010) to construct rough estimates of the elasticity of SNAP participation with respect to overall unemployment rates. To construct my estimates, I use unemployment data from the US Bureau of Labor Statistics to calculate the percent change produced by a one percentage point increase from the average unemployment rate over the time periods in the two studies. Combining these percent changes with the estimated effects on SNAP

participation from the two studies, both studies yield an elasticity of roughly 0.20. Employing the same method for the results of my analysis, I estimate an elasticity of roughly 0.17. This confirms that the effect of changes in the low-skilled unemployment rate on SNAP participation is roughly comparable to the effect of changes in the overall unemployment rate on participation.[17]

In addition, my findings are largely consistent with the results of previous studies that show a lagged effect of unemployment on SNAP participation. Rough estimates of the elasticity of participation in response to lagged unemployment rates, calculated from Mabli et al. (2009), Mabli and Ferrerosa (2010), and my analysis, indicate that the effect of changes in the one-year lagged low-skilled unemployment rate on participation is nearly two-thirds as large as the effect of the lagged overall unemployment rate. Similarly, the effect of changes in the two-year lagged low-skilled unemployment rate on participation is nearly half as large.

Policy Implications

The results of my analysis offer a mixed bag for advocates and critics of the SNAP program. The small effect of low-skilled unemployment on SNAP participation might reflect the fact that unemployed individuals may simultaneously take advantage of SNAP and other options available for public assistance. This may raise questions among critics about the relative utility of SNAP when compared to other government programs designed to assist unemployed individuals. Yet, at the same time, my findings show that SNAP adapts to some extent to the level of economic need among the low-skilled population. For advocates, this flexibility may provide evidence that SNAP has value in alleviating unmet needs. From this perspective, the small effect of low-skilled unemployment may reflect individuals' lack of awareness of SNAP and their eligibility for benefits.

Despite this ambiguity, the evidence from my analysis of a delay between changes in unemployment and participation suggests the need for restraint among policymakers in drawing hasty conclusions about the utility of the program. These findings show that much of the shift in SNAP participation does not immediately follow changes in economic conditions for low-skilled individuals, so the effects of benefit receipt, positive or negative, are unlikely to emerge for a period of time. Furthermore, my analysis leads to the conclusion that the current efforts to cut SNAP funding during an economic recovery may weaken the program and erode a source of support for those individuals who have been hard-hit by the recession. Consequently, policymakers should be cautious about proposing reductions in program funding.

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[17] Using SNAP participation of low-skilled individuals rather than overall SNAP participation as the dependent variable in my regression would arguably demonstrate a stronger relationship between participation and low-skilled unemployment. However, the US Department of Agriculture does not publish such data.

Analytical Limitations

Although my analysis includes a wide range of controls, it may nevertheless be subject to omitted variable bias. Several time-varying factors that determine SNAP participation are not easily measurable, and therefore they are not included as control variables in my regression model. These include individuals' awareness of the existence of the SNAP program, their perception of eligibility for benefits, the ease of applying for benefits, the level of stigma associated with food stamp benefits, and individual expectations about future income. Federal outreach spending, which is provided to states to encourage SNAP participation, is also excluded from my analysis. This variable is excluded from the regression analysis due to the practical difficulty in accurately measuring it.[18] The exclusion of these factors may bias the key coefficient in my regression results. Nonetheless, my model specification follows the practice of previous studies of controlling for policy, economic, and some demographic factors, thereby lending credibility to my findings.

Conclusion

While the above analysis demonstrates that participation in SNAP increases as the unemployment rate rises among low-skilled individuals, it also suggests that the growth rate of SNAP participation increases as low-skilled unemployment rises and that there is some lag time between the change in unemployment and that in participation. Furthermore, the responsiveness of SNAP participation to the economic conditions of the low-skilled population increased after the passage of the 2008 Farm Bill. Finally, the estimated effect of the low-skilled unemployment rate on SNAP participation is comparable to the effect of the overall unemployment rate on participation as reported in previous studies. These results exemplify the continuing need to study the factors that are associated with SNAP participation, as understanding the dynamics of participation can help to pinpoint more precisely how SNAP receipt is related to disadvantage. Further research along these lines can improve the targeting of SNAP benefits toward those individuals who may benefit the most from this form of public assistance.

IX. APPENDIX

Sensitivity Analysis

Tables 6 and 7 present the results of sensitivity analyses that test the robustness of the findings from the main regression analyses. Column 1 in Table 6 replicates the full model

[18] The USDA makes no distinction between the expenditures that are devoted to outreach efforts and those that are devoted to other operational costs, making the accurate measurement of state outreach efforts difficult. Mabli and Ferrerosa (2010) acknowledge this challenge when constructing their measure of state outreach funding and caution that inaccuracies in their categorization of expenditures as outreach spending may bias their results.

from column 5 of Table 4 for ease of comparison. Column 2 in Table 6 shows the results of a regression that omits the variable controlling for the percentage of the state population without a high school degree, because this variable and the low-skilled unemployment rate are mechanically correlated. The model in column 3 of the same table includes overall state employment rates as a control variable, in order to control for employment changes that may affect SNAP participation for population groups other than those without a high school degree.[19] This control variable was previously excluded from the main regression model due to its mechanical correlation with the low-skilled unemployment rate. Finally, the model in column 4 of Table 6 omits the control variable that measures the percentage of the state population that is disabled. After 2007, the American Community Survey modified the way that it measures the percentage of disabled civilians; the model in column 4 therefore tests whether the inclusion of this control variable in the main regression model affects the key coefficient despite the change in measurement.

In Table 7, columns 1 and 2 show the results of the full regression models with the original policy dummy variables before imputation and without population weights, respectively. Column 3 shows the results of the full regression model when the actual adjusted minimum wage is included, rather than its logarithm. In summary, the coefficients for the low-skilled unemployment rate in these analyses are comparable to the estimates from the main regression model. This reinforces the findings from the main analysis and indicates that they are robust to reasonable changes in the regression model.

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[19] The employment rate is obtained from the US Census Bureau and measures the percentage of the state civilian population 16 years and older that is employed. The denominator for this variable reflects a count of all individuals 16 years and older and is not limited to labor force participants (US Census Bureau 2012).

Table 6. Sensitivity Analysis				
Dependent Variable	SNAP participation per 100,000 people			
	(1)	(2)	(3)	(4)
State and Year Fixed Effects	Yes	Yes	Yes	Yes
Key Independent Variable				
Low-skilled Population	138.56***	135.30***	79.91**	138.38***
Unemployment Rate	(34.110)	(37.160)	(32.150)	(34.440)
Demographic Variables				
Percent Population	270.7		252.33	244.29
without High School Degree	(197.020)		(208.030)	(162.620)
Percent Households	45.36	34.22	18.03	46.33
with Children	(176.530)	(178.860)	(175.690)	(176.870)
Percent Population	1,243.04**	1,157.52*	849.6	1,225.45**
that is Elderly	(560.620)	(581.100)	(662.250)	(575.630)
Percent Population	-5,292.90	-9,094.60	4,354.42	-4,652.43
that is Immigrant	(40,843.430)	(39,135.610)	(39,836.400)	(39,993.710)
Percent Population	-69.9	35.65	-46.04	
that is Disabled	(226.910)	(197.710)	(221.970)	
Economic Variables				
Employment Rate			-251.55*	
Percent Households	601.92	643.11	515.84	587.94
on Cash Assistance	(394.820)	(412.640)	(378.660)	(389.770)
Minimum Wage	-270.55	-464.81	-292.13	-303.32
(logarithm)	(670.390)	(698.920)	(645.550)	(656.490)
Policy Variables				
Simplified Reporting	-1,133.49**	-1,110.48**	-1,058.13**	-1,153.85**
	(494.160)	(509.900)	(462.790)	(492.420)
Transitional Benefits	318.64	253	254.51	308.54
	(249.940)	(260.290)	(247.570)	(239.280)
Vehicle Exclusion	364.76	411.72	338.03	375.63
	(295.340)	(297.000)	(285.610)	(287.590)
Categorical Eligibility	-186.12	-126.95	-184.76	-178.56
	(356.730)	(386.920)	(369.320)	(363.750)
Constant	-12,135.06	-7,534.58	8,952.30	-12,513.07
	(11,233.250)	(11,781.380)	(19,555.330)	(10,872.170)
Observations	342	342	342	342
R-squared	0.925	0.924	0.927	0.925

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Dependent Variable	SNAP participation per 100,000 people		
	(1)	(2)	(3)
State and Year Fixed Effects	Yes	Yes	Yes
Key Independent Variable			
Low-skilled Population	140.90***	130.45***	138.44***
Unemployment Rate	(37.030)	(27.310)	(34.080)
Demographic Variables			
Percent Population	232.65	154.84	271.49
without High School Degree	(216.540)	(123.800)	(193.340)
Percent Households	66.66	141.42	45.31
with Children	(188.810)	(103.180)	(175.920)
Percent Population	1,227.89**	1,010.90***	1,244.71**
that is Elderly	(588.180)	(337.210)	(561.610)
Percent Population	-1,457.23	-39,850.33*	-5,600.47
that is Immigrant	(42,002.750)	(22,414.090)	(40,627.300)
Percent Population	-73.99	27.91	-70.53
that is Disabled	(251.920)	(142.110)	(226.430)
Economic Variables			
Percent Households	642.23	640.52**	602.97
on Cash Assistance	(423.150)	(279.650)	(394.470)
Minimum Wage	-525.46	-98.99	
(logarithm)	(668.960)	(585.510)	
Minimum Wage			-37.2
			(120.750)
Policy Variables			
Simplified Reporting		-440.83	-1,129.96**
		(463.390)	(497.280)
Transitional Benefits		194.59	323.54
		(336.370)	(253.720)
Vehicle Exclusion		116.13	365.62
		(242.030)	(295.410)
Categorical Eligibility		294.29	-183.54
		(243.470)	(355.150)

Table 7. Additional Sensitivity Analysis

Table 7. Additional Sensitivity Analysis			
	(1)	(2)	(3)
Policy Variables Before Imputation			
Simplified Reporting	-1,151.37**		
	(498.660)		
Transitional Benefits	388.22		
	(271.460)		
Vehicle Exclusion	358.42		
	(312.470)		
Categorical Eligibility	-152.53		
	(361.210)		
Constant	-11,965.86	-11,152.26*	-12,404.88
	(11,504.720)	(5,951.360)	(11,258.140)
Observations	306	342	342
R-squared	0.926	0.916	0.925

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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