THE RELATIONSHIP BETWEEN LOW-SKILLED UNEMPLOYMENT RATES AND SNAP PARTICIPATION

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ABSTRACT

The Supplemental Nutrition Assistance Program (SNAP) is designed to operate counter-cyclically, with participation rising as the economy contracts and declining as the economy expands. The growth in the costs of and participation in SNAP in recent years has raised political concerns over whether the program serves people who truly need assistance. Policymakers have also questioned how well the program responds to the unmet needs of disadvantaged groups. Using state-year panel data, this study employs a fixed effects specification to test the sensitivity of SNAP participation to the state-level unemployment rates of low-skilled individuals. The analysis shows a statistically significant, positive, yet reasonably small correlation between SNAP participation and the unemployment rates of the low-skilled population. The results also indicate that the relationship between SNAP participation and low-skilled unemployment becomes stronger as unemployment rises and that much of the take-up of benefits lags behind unemployment. These findings largely confirm the counter-cyclical nature of the program and suggest the need for caution among policymakers in reaching conclusions about the utility of the program, as its response to economic conditions is not necessarily immediate.

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Many thanks,
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INTRODUCTION

The Supplemental Nutrition Assistance Program (SNAP), formerly called the Food Stamp Program, provides benefits to low-income individuals to enable them to purchase food.[1] One of the largest components of the U.S. social safety net, SNAP is administered at the federal level by the United States Department of Agriculture (USDA). In an average month in 2011, it served 44.7 million people. SNAP plays a critical role in reducing poverty, particularly among children (Tiehen et al., 2012). Research indicates that, if SNAP benefits were counted in the official poverty measure in 2010, they would have lifted 3.9 million people out of poverty, including 1.7 million children (U.S. Dept. of Agriculture, 2012).

While SNAP is considered to be an anti-poverty program, there is a political debate over whether the program contributes to dependence on government welfare. In 2011, federal expenditures related to SNAP totaled $78 billion (Congressional Budget Office, 2012). Funding for SNAP was appropriated through the 2008 Farm Bill; in anticipation of the bill's expiration in September 2012, Congress spent the summer of 2012 hotly debating the amount of funding to cut from SNAP in a new Farm Bill. The bill that passed the Senate sought to reduce SNAP funding by $4.5 billion over a 10-year period (Nixon, 2012). The House Agriculture Committee proposed a $16.5 billion reduction in funds over the same time period, but disagreement among House members stalled the proposed legislation (Steinhauer, 2012). After the 2008 Farm Bill expired, Congress passed a continuing resolution that maintained 2012 funding levels for government programs, including SNAP, until the end of March 2013 (Weisman, 2012). The

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

resolution was renewed again in March 2013 to fund the federal government through the end of September 2013 (Goldfarb, 2013).

These political debates over SNAP funding reflect a basic question: To what extent should the U.S. government provide direct assistance to low-income citizens? At the heart of this debate are opposing beliefs about the best way to help individuals of low means climb out of poverty. Those who favor more direct government assistance to poor families often argue that it relieves low-income individuals from the all-consuming effort to meet their basic needs, enabling them to focus their energies on opportunities to improve their economic condition. Placed in the context of the SNAP funding debates, this translates into arguments that SNAP has served as a much-needed cushion during the ongoing 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, those who favor less assistance believe that a social safety net acts as a crutch for the poor, robbing them of the incentive to work and encouraging them to remain on the "government dole" rather than to improve their circumstances. According to this perspective, these individuals continue to claim food stamps even when they can find work to sustain themselves. Proponents for lower SNAP funding argue that cuts will force the program to become more efficient by serving only those who are legitimately in need and will root out long-term dependence on government welfare (Rector, 2012).

This paper contributes to this debate by exploring the question: How do 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, then, is to test the sensitivity of SNAP

participation to changes in the unemployment rates of a disadvantaged group. This research question has important policy implications. If SNAP participation is unaffected by unemployment, this suggests that recipients take advantage of the program's benefits regardless of their employment circumstances. Such a finding may imply that SNAP is not fulfilling its goal of providing benefits primarily to individuals in need. It may also indicate a need for limits on the provision of benefits and on federal spending. In contrast, if SNAP participation is sensitive to unemployment, this provides evidence that recipients' use of the program varies with their level of economic need and that the program is performing as intended.

To answer my research question, I combine annual data on aggregated state totals of the number of individuals who participate in SNAP, available from the U.S. Department of Agriculture, with annual data on state-level unemployment rates of the portion of the U.S. population that did not graduate from high school, available through the U.S. Census Bureau's American Community Survey series. 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. The main findings of this study are that there is a positive, non-linear, and relatively small relationship between SNAP participation and the unemployment rates of the low-skilled population. Furthermore, unemployment among this group has a lagged effect on participation that is larger than its contemporaneous effect on participation.

BACKGROUND

The Supplemental Nutrition Assistance Program (SNAP) and its predecessor, the Food Stamp Program (FSP), are means-tested social programs that have provided benefits to low-income individuals for over 40 years. SNAP is federally funded through the U.S. Department of Agriculture and enables recipients to purchase food at authorized food retailers using an electronic debit card. Food purchases are limited to food items used at home. Items that cannot be bought using SNAP benefits include alcohol, tobacco, hot food, and food consumed in stores (U.S. Dept. of Agriculture, 2012).

To be eligible for benefits, households must have monthly gross and net incomes below 130 percent and 100 percent, respectively, of the poverty line.[2] They must also have less than $2,000 in assets, or less than $3,250 if they include an elderly or disabled member. Additional rules apply to working adults without children and individuals who are not U.S. citizens (U.S. Dept. of Agriculture, 2012). SNAP benefits are designed to provide the poorest families and individuals with the greatest amount in benefits. Individuals and households with little to no income receive the maximum benefit, and benefits decrease by 30 cents for each additional dollar in net income. The federal government pays for all of the benefits and shares half of the program's administrative costs with the states (Tiehen et al., 2012).

SNAP reaches many segments of the U.S. population that are highly vulnerable to economic downturns. In fiscal year 2011, 76 percent of SNAP households contained children, elderly individuals, or disabled members. Forty-seven percent of all SNAP households included

[2] 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 (U.S. Dept. of Agriculture, 2012).

children; of this group, 56 percent were headed by single parents. Eighty-three percent of SNAP households had incomes below the federal poverty level in fiscal year 2011. Only eight percent of SNAP households received cash assistance from the Temporary Assistance for Needy Families program (Strayer et al., 2012).[3]

SNAP and the Food Stamp Program have been shown to provide significant benefits to participating vulnerable households. Participation in FSP has been associated with lower volatility in income and food consumption for low-income families (Gundersen & Ziliak, 2003), and with lower probabilities of having inadequate access to food (Ratcliffe & McKernan, 2010). Participation in SNAP has also been associated with better access to adequate food (Coleman-Jensen et al., 2012). The temporary increase in SNAP maximum benefit levels, mandated by the 2009 American Reinvestment and Recovery Act (ARRA), was associated with improved food security for low-income households between 2008 and 2009 (Nord & Prell, 2011). Food stamp receipt has also been linked to a lower risk that households will fall behind on housing, utility, and medical expenses (Shaefer & Gutierrez, 2011).

Previous research also suggests that food stamps improved various outcomes for children in low-income households. Participation in FSP, and later SNAP, has been associated with a decrease in the depth and severity of poverty among low-income households with children during the 1990s (Jolliffe et al., 2005) and from 2000 through the 2009 recession (Tiehen et al., 2012). Children in participating households with lower food security also tend to have lower odds of being in poor health than their counterparts in non-participating households (Cook et al.,

[3] 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).

2006). In addition, participation was also positively correlated with reading and mathematics scores for female students in kindergarten through third grade (Frongillo et al., 2006).

Despite these benefits, the significant growth in SNAP expenditures has fueled the ongoing Congressional disagreement over SNAP funding. This growth is driven by concurrent increases in benefit levels and participation. Federal spending on SNAP totaled $78 billion in 2011, more than double the $34 billion spent in 2007 (Congressional Budget Office, 2012). The average monthly benefit in 2011 was $284 per household, up from $215 in 2007 (USDA FNS Program Data, 2012). These increases have been partially attributed to the indexation of benefits to food prices and to temporary maximum benefit increases under the 2009 American Recovery and Reinvestment Act (Congressional Budget Office, 2012).

Participation in SNAP has also grown, driven by changes in the economy over the past few years. The 2007-2009 Great Recession more than doubled the national unemployment rate from 4.6 percent in 2007 to 9.6 percent in 2010. As a result, the number of individuals participating in SNAP increased. Some 26 million people received SNAP benefits in 2007, representing approximately 69 percent of all individuals eligible for SNAP in that year. The number of participants increased to 33 million in 2009, representing nearly three-quarters of all people eligible for SNAP that year. In 2011, SNAP served nearly 45 million individuals (Congressional Budget Office, 2012; Leftin et al., 2011).

SNAP is intended to work as a counter-cyclical program. In theory, participation in the program should rise during recessionary periods when employment declines, household incomes decrease, and more people become eligible for benefits. Participation in the program should also decline during economic expansions when employment increases, household incomes increase,

and fewer people are eligible for benefits. SNAP participation has closely tracked the national unemployment rate for most of the program's history (Andrews, 2012). Nevertheless, while SNAP advocates see its growth as an example of its continued responsiveness to economic need, policymakers who argue for reductions in SNAP funding view the program's recent growth as another instance of runaway costs and government dependency ("Food Stamps Expansion Driven By Politics", 2012).

My analysis provides insight into this debate by examining whether SNAP is operating counter-cyclically as intended. In particular, I seek to determine how well SNAP responds to changes in unemployment for a disadvantaged group, namely, the segment of the population without a high school degree.

LITERATURE REVIEW

There is a body of research on the Food Stamp Program (FSP) and the Supplemental Nutritional Assistance Program (SNAP) that assesses their effectiveness as a buffer for low-income households against economic downturns. Previous literature has consistently found that changes in the economy have an impact on FSP and SNAP participation. However, 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. The following literature review highlights previous findings on the effects of the economy and of SNAP policies on SNAP participation.

The Impact of the Economy on FSP and SNAP

Most of the literature confirms that, once the effects of FSP and SNAP policies are accounted for, the program responds counter-cyclically to changes in the economy. Employing a fixed effects model with state-year panel data, Ziliak et al. (2003) find a positive correlation between state unemployment rates and contemporaneous food stamp caseloads between 1980 and 1999. Cook et al. (2000) estimate a fixed effects model using state-year data and find a positive association between state unemployment rates and food stamp caseloads per capita between 1994 and 1998. Similarly, Mabli et al. (2009) analyze the effect of state unemployment rates between 2000 and 2006 on the number of FSP-eligible individuals. Using a fixed effects model with state-year data, the authors find a positive relationship between the state unemployment rate and the number of FSP-eligible individuals at the state level. They also find that FSP caseloads were negatively associated with state labor force participation rates and with minimum wage levels.

Using a fixed effects model that employs data measured at the state level every six months, Danielson and Klerman (2006) find a positive correlation between state unemployment rates and food stamp caseloads between 1989 and 2004. The authors conduct simulations using their regression results and conclude that the economy accounts for a larger share of the change in caseloads than FSP policies over the period under study. A follow-up study in 2011 by the same authors uses state-month panel data in a fixed effects model that examines the relationship between FSP and SNAP caseloads and state unemployment rates between 1989 and 2009. The results show a positive contemporaneous relationship between unemployment and caseloads. They also provide evidence for a lagged relationship, as changes in unemployment took several years to be reflected in the FSP caseloads (Klerman & Danielson, 2011).

The Effect of Other Factors on the Relationship between the Economy and FSP

The literature also indicates that policies unrelated to food stamps can modify the effect of unemployment on participation. Using state-month-year data, a fixed effects analysis by Bitler and Hoynes (2010) suggests that the effect of state unemployment rates on food stamp caseloads differed after welfare reform. Examining the time period between 1980 and 2009, they estimate that the positive impact of state unemployment on food stamp caseloads per capita became larger after welfare reform in 1996.

In addition, the effect of unemployment on participation differs by the type of SNAP recipient. A fixed effects analysis by Mabli and Ferrerosa (2010), using state-year data between 2000 and 2008, suggests that the average state unemployment rate was positively correlated with FSP and SNAP per capita caseloads. However, relative to the effect of unemployment on participation for single-parent and elderly-only households, the impact of unemployment on

participation was larger for households consisting of multiple adults living with children or with an elderly member, and for adults-only households. The state unemployment rate also had a larger effect on FSP caseloads for the poorest participating households, relative to those with more income. Furthermore, the authors found that over half of the increase in caseloads during this period could be explained by the economy. This finding supported the conclusions of Danielson and Klerman (2006) and Mabli et al. (2009) that the economy had a stronger relationship with the growth of caseloads than FSP policies.

The Impact of FSP and SNAP Policies on Participation

As discussed, some of the existing research on SNAP and FSP has been devoted to assessing how well the programs respond to economic conditions that affect low-income households. The difficulty for researchers in this regard lies in separating the effect on participation of FSP and SNAP policies from the concurrent effect on participation of economic changes. 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, as the economy underwent a recession, states were given the discretion to implement FSP policies designed to streamline the program and expand access to benefits. Many states eased income reporting requirements for SNAP households and opted to exclude the total value of a vehicle from a household's assets when determining its eligibility for benefits

(U.S. Dept. of Agriculture, 2003). In addition, in the early 2000s states permitted households that participate in other federal and state assistance programs to qualify for food stamp receipt.

The 2002 Farm Bill reinstated FSP eligibility for certain types of immigrants; simplified the treatment of income in determining FSP eligibility; and funded state efforts to improve program access, increase outreach activities, and encourage participation (Mabli et al., 2009). It also gave states the option of providing transitional food benefits to families who moved off of welfare (U.S. Dept. of Agriculture, 2003). More recently, during the 2007-2009 recession, the 2008 Farm Bill excluded retirement and educational savings accounts from the counting of assets when determining household eligibility for SNAP benefits. It also moderately increased the program's standard and child care deductions, which effectively lowered the amount of applicants' net incomes that is used to determine their benefit levels (Andrews, 2012). Furthermore, the 2009 American Reinvestment and Recovery Act temporarily raised the maximum monthly benefit by nearly 14 percent (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) use a fixed effects model with household-state-month data to show a positive association between various policies that loosened FSP eligibility requirements and FSP participation from 1996 to 2003. In particular, they find a positive relationship between participation and the exemption of vehicles from asset limits, a conclusion that contradicts a previous study by Hanratty (2006) that found no such significant relationship.

In another study, Mabli et al. (2009) find that simplified reporting and expanded categorical eligibility were positively associated with the growth in FSP caseloads between 2000

and 2006. The authors also find, however, that the availability of outreach expenditures had no statistically significant association with overall participation. A subsequent study by Mabli and Ferrerosa (2010) largely confirms the latter finding, but also concludes that between 2000 and 2008, the availability of outreach spending was positively correlated with the number of SNAP caseloads per capita for the poorest households (at or below 50 percent of the federal poverty level), elderly-only households and adults-only households.

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. Other researchers have included controls for the share of the population within specific age categories (Danielson & Klerman, 2006; Klerman & Danielson, 2011), family characteristics (Hanratty, 2006), household composition (Ratcliffe et al., 2008), the share of non-citizens in the population (Mabli & Ferrerosa, 2010) and the presence of single-female headed households (Bitler & Hoynes, 2010).

Implications for this Study

In summary, the existing literature confirms a relationship between SNAP participation and unemployment rates. Previous studies have used overall state unemployment rates as a measure of economic changes. However, this overall measure does not offer a precise picture of the responsiveness of SNAP to unemployment among disadvantaged groups. Overall state unemployment rates measure the economic conditions of individuals at the state level regardless of their income levels, their eligibility for SNAP benefits, or their likelihood to ever use the program. This approach makes these unemployment rates a less perfect measure of the

economic conditions of those disadvantaged individuals who are the targets of the SNAP program.

In contrast to the previous literature, I examine the relationship between SNAP participation and state-level unemployment rates among low-skilled individuals. This potentially offers a cleaner measure of the responsiveness of SNAP to the changes in economic conditions of a disadvantaged group that the program is intended to help. My study, therefore, provides a more direct test of the link between SNAP and unemployment, as the program is intended specifically to assist low-income families.

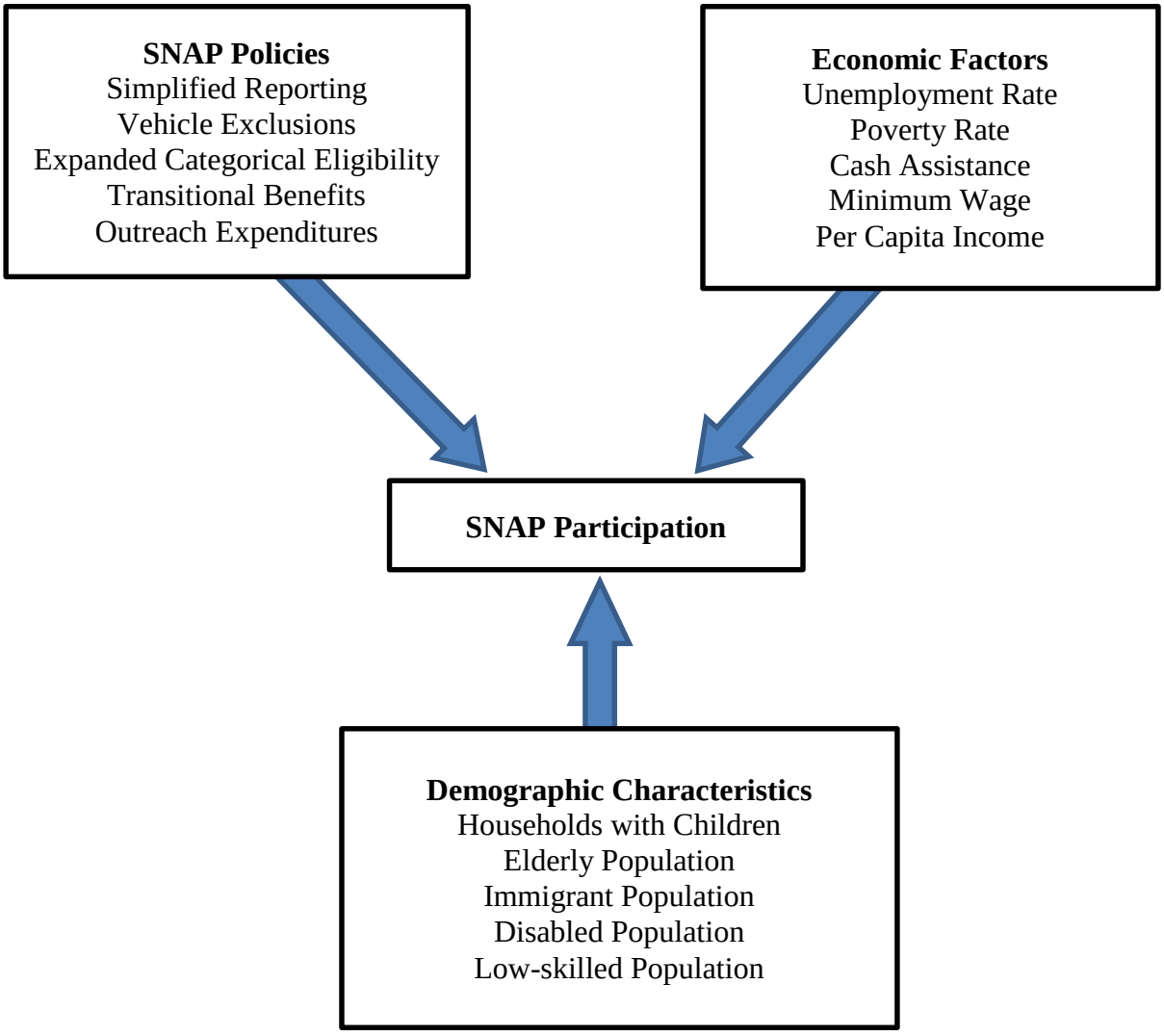
CONCEPTUAL FRAMEWORK

I hypothesize that state-level unemployment rates for the low-skilled population are positively correlated with the number of SNAP participants. In other words, I predict that as the unemployment rate of low-skilled individuals in a state increases, the number of SNAP participants in that state also increases. As noted in the Literature Review section, economic conditions and the adoption of SNAP policies are two determinants of 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. Following previous studies, my model also accounts for the demographic composition of state populations. These factors are diagrammed in Figure 1 below.

Demographic Composition

SNAP households participate in the program at different rates. SNAP benefits increase with need, so the poorest households are most likely to participate in SNAP (Congressional Budget Office, 2012). Individuals in households with children, households with incomes below the federal poverty level, and households that receive benefits through the Temporary Assistance to Needy Families program (TANF) also participate at high rates. In contrast, households that include the elderly, immigrants, childless non-disabled adults, households that receive earnings, and households that are eligible for SNAP but are above the federal poverty level (between 100 and 130 percent of the federal poverty level) participate at lower rates (Leftin et al., 2011).

Figure 1. Conceptual Framework of the Factors that Affect SNAP Participation[4]



Adoption of SNAP Policies

The 2002 Farm Security Act reversed many of the restrictions imposed on the Food Stamp Program under welfare reform. After 2001, federal regulations enabled states to adopt optional policies intended to expand eligibility, encourage participation, and streamline FSP

[4] 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.

operations at the state level (Andrews, 2012). While there are currently at least 15 policy options that states can implement, the following policy options directly impact the accessibility of benefits (U.S. Dept. of Agriculture, 2010), have been recognized in previous research, and were implemented in the period of time encompassed in my study:

- **Simplified Reporting**

  Legislative changes in 2001 and the 2002 Farm Security Act provided states with the option to simplify the reporting of FSP household income and to lengthen certification periods (Mabli & Ferrerosa, 2010).[5] Under this option, households no longer had to report changes in income until their earnings rose above the SNAP eligibility income threshold; many households also did not have to re-certify until six months after the last certification (Andrews, 2012). This reduced the income reporting burden on households and made it easier for them to receive benefits. By 2003, 33 states were using simplified reporting (Andrews, 2012); by 2005, 44 states had adopted this option. By 2010, simplified reporting has been implemented in 49 states (U.S. Dept. of Agriculture, 2010).

- **Vehicle Exclusions**

  To be eligible for SNAP benefits, a household's assets must fall under eligibility thresholds of $2,000, or $3,250 if the household includes an elderly or disabled member (U.S. Dept. of Agriculture, 2012). Legislative changes in 2001 gave states the option to exclude vehicles in the counting of assets when determining household eligibility. In 2005, 25 states excluded all vehicles from these asset limit tests (U.S. Dept. of Agriculture, 2005); by 2010, 34 states had implemented this exclusion (U.S. Dept. of Agriculture, 2010).

[5] 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 & Ferrerosa, 2010).

- **Expanded Categorical Eligibility**

In states that have availed themselves of the expanded categorical eligibility option, households that participate in TANF, Supplemental Security Income, or General Assistance Programs automatically qualify for SNAP benefits. Categorically eligible households are not subject to asset tests (Congressional Budget Office, 2012). In 2002, nine states were using this option (Andrews, 2012). By 2010, 45 states had implemented the policy (U.S. Dept. of Agriculture, 2010).

- **Transitional Benefits**

This policy option was first offered under the 2002 Farm Bill; it enables state agencies to provide food stamp benefits for up to five months to households that are in the process of leaving the TANF program. By 2005, 15 states had implemented this option (U.S. Dept. of Agriculture, 2005). By 2010, 21 states provided this benefit to TANF recipients (U.S. Dept. of Agriculture, 2010).

- **Outreach Expenditures**

The 2002 Farm Security Act authorized the USDA to provide outreach grants to the states and community organizations to increase access and participation in FSP. As noted in the Literature Review section, while previous research has shown no significant relationship between outreach and overall participation, there is some evidence that outreach is positively correlated with participation among the poorest households and households that are adults-only or that include only the elderly (Mabli & Ferrerosa, 2010).

While all these factors have a plausible effect on participation, I have been unable to find credible measures for one of these factors, namely, outreach expenditures. 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. For the factors that can be accurately measured, a summary of data sources, the method of analysis used in this study, and descriptive statistics on the data collected are presented in the next section.

DATA & METHODS

This study combines state-level data for all 50 states and the District of Columbia from several sources. Data on state unemployment rates, economic factors, and demographic characteristics of the U.S. population were collected from the U.S. Census Bureau's American Community Survey (ACS) 1-year series. The ACS randomly samples three million addresses every year to produce annual estimates of the demographic and economic characteristics of the U.S. population for geographic areas with population totals of 65,000 or more.[6] It was not fully implemented until 2005 (U.S. Census Bureau, 2009). Furthermore, as of this writing, the U.S. Census Bureau has not published ACS data for 2012. My analysis is therefore restricted to the years 2005 through 2011.

Data on SNAP participation were collected for the years 2005-2011 to match the time period for which ACS data were available. Data on state totals of SNAP participants 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 state adoption of SNAP policies was obtained from the USDA FNS SNAP State Options Reports, Editions 5 through 9, corresponding to policy data for the years 2005-2007 and 2009-2010.[8]

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[6] U.S. Census Bureau ACS data are available online at http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.

[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. Similarly, as of this writing, no State Options Report was published for the year 2011. In footnote 10, 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 is available.

I estimate a fixed effects regression model to analyze the relationship between the unemployment rates of the low-skilled population and SNAP participation. My fixed effects specification controls for differences between states that do not change over time and that are correlated with SNAP participation and unemployment rates. 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. I estimate the following model, with the state-year as the unit of analysis:

$$\mathbf{Foodstamp}_{it} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{unemployedlowskill}_{it} + \boldsymbol{\beta_2}\mathbf{lowskilled}_{it} + \boldsymbol{\beta_3}\mathbf{householdchild}_{it} + \boldsymbol{\beta_4}\mathbf{elderly}_{it} + \boldsymbol{\beta_5}\mathbf{immigrant}_{it} + \boldsymbol{\beta_6}\mathbf{disabled}_{it} + \boldsymbol{\beta_7}\mathbf{povertyrate}_{it} + \boldsymbol{\beta_8}\mathbf{cashassistance}_{it} + \boldsymbol{\beta_9}\mathbf{minimumwage}_{it} + \boldsymbol{\beta_{10}}\mathbf{percapitaincome}_{it} + \boldsymbol{\beta_{11}}\mathbf{simplifiedreporting}_{it} + \boldsymbol{\beta_{12}}\mathbf{transitionalbenefit}_{it} + \boldsymbol{\beta_{13}}\mathbf{categoricaleligibility}_{it} + \boldsymbol{\beta_{14}}\mathbf{vehicle}_{it} + \boldsymbol{\alpha_i} + \boldsymbol{\gamma_t} + \boldsymbol{\mu_{it}},$$

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). Due to missing values in the dataset for some variables in the regression model, my final sample size is 342 observations. I explain why the data is missing and how it is handled in footnote 10.

The model includes control variables that are plausibly correlated with FSP and SNAP participation and unemployment. Specifically, I control for the demographic characteristics of state populations, economic factors, and SNAP policy options adopted by states over the period under study. Table 1 provides definitions for all of the variables.

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 U.S. Department of Agriculture 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 (U.S. Dept. of Agriculture, 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.
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.

Table 1, continued

Economic Characteristics	
Povertyrate	This continuous variable measures the percentage of the state population with individual or family incomes below the poverty level. These data are gathered from the ACS. The Census Bureau determines poverty status by comparing the total income received during the 12 months prior to the day of the survey interview to its adjusted poverty thresholds (U.S. Census Bureau, 2012).
Cashassistance	This continuous variable measures the percentage of households in a state that received cash assistance from the Temporary Assistance for Needy Families and General Assistance programs during the 12 months prior to the day of the survey interview (U.S. 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 U.S. Census Bureau.
Percapitaincome	This continuous variable measures the state's per capita income. The per capita income is adjusted for inflation and expressed in 2011 dollars using the annual Consumer Price Index for All Urban Consumers. These data are gathered from the ACS.
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.

DESCRIPTIVE STATISTICS

Table 2 provides descriptive statistics for the dependent and key independent variables and for state demographic characteristics and economic factors. Table 3 presents descriptive statistics for the 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. SNAP participation per capita ranges from a minimum of 4,111 participants per 100,000 people in a state (New Hampshire in 2005) to a maximum of 21,820 participants per 100,000 people in a state (Washington DC in 2011). 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 over the 2005-2011 time period; unemployment within this group ranged from 3.5 percent (Hawaii in 2005) to 29.9 percent (Washington DC in 2011).[9]

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

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	3.50	29.90	4.27
Demographic Characteristics				
Percentage of Population without High School Degree	15.11	7.70	22.10	3.49
Percentage of Households with Children	30.71	16.70	40.30	2.70
Percentage of Population that is Elderly	12.70	6.60	17.60	1.83
Percentage of Population that is Immigrant	0.07	0.00	0.16	0.04
Percentage of Population that is Disabled	13.36	8.50	23.70	2.55
Economic Factors				
Poverty Rate	14.09	7.10	22.60	2.82
Percentage of Households on Cash Assistance	2.56	1.10	6.70	0.83
Minimum Wage (2011 Dollars)	7.02	2.77	8.96	0.99
Per Capita Income (2011 Dollars)	27,974	19,583	44,578	3,769
N = 342				

Table 3 shows the percentage of states in the sample that adopted various SNAP policies. These statistics show that over three-quarters of states adopted simplified reporting in 2005; this share increased to nearly 100 percent of the states in 2011. Similarly, the proportion of states that excluded vehicles from SNAP eligibility determination increased from nearly half in 2005 to about two-thirds in 2011. Furthermore, over three-quarters of states had adopted categorical eligibility by 2005. By 2011, over 80 percent of the states had implemented this option. In contrast, transitional benefits were favored by less than a third of the states in 2005. This share increased slightly to less than half of the states by 2011.[10]

[10] Data on the state adoption of the four SNAP policies of interest (simplified reporting, transitional benefits, vehicle exclusion and expanded categorical eligibility) were not available for fiscal years 2008 and 2011 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. Missing 2011 data for these variables were imputed using the assumption that a policy adopted in 2010 continued to be implemented in 2011. Similarly, if a policy was not adopted in 2010, it was also assumed not to have been adopted in 2011. Other than the policy options, there were no other missing values in my dataset. The original dataset contained 18 variables, with 357 state-year observations (51*7), for a total of 6,426 data points. Some 102 observations (51*2) did not have data for the four policy variables, for a total of 408 missing values, or about six percent of the data points. Using the above-mentioned assumptions, values were imputed for 391 of the 408 missing data points. Some 15 observations contained the data that could not be imputed. These 15 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 sensitive to the inclusion of imputed data in the SNAP policy variables. A series of t-tests show that there are statistically significant differences at a five percent significance level in some of the demographic and economic characteristics (the percentage of households with children, the percentage of the population that is elderly, the percentage of the population that is disabled, the percentage of the population without a high school degree, and the minimum wage dummy) 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. Although this may bias the coefficients for these control variables, this is not a concern because their effects on SNAP participation are not the main focus on this study. Moreover, the key coefficient of interest remains positive whether the regression uses imputed or non-imputed data.

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%	96%
Vehicle Exclusion from Asset Test	49%	51%	57%	67%	73%	67%	67%
Expanded Categorical Eligibility	76%	73%	69%	77%	78%	88%	88%
Transitional Benefits	29%	33%	35%	36%	37%	41%	41%
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.

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. The full model with all controls is shown in column (5). Table 5 shows alternative functional form specifications of the main regression model. For all these regressions, I estimate robust standard errors clustered at the state level to correct for heteroskedasticity and autocorrelation. The 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. Furthermore, in these regressions the minimum wage and per capita income are expressed as logarithms, rather than as the absolute dollar amounts shown in Table 2.[11] I begin with a discussion of the results shown in Table 4.

[11] In a sensitivity test, I also estimate a version of the regression model that uses the untransformed minimum wage and per capita income variables as controls. 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 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 Unemployment Rate	95.50***	217.65***	171.32***	79.84*	65.02*
	(34.31)	(47.59)	(49.09)	(42.21)	(35.83)
Demographic Variables					
Percent Population without High School Degree	3.10		305.67	130.00	176.63
	(66.42)		(268.98)	(240.32)	(207.68)
Percent Households with Children	-59.66		118.63	46.88	6.80
	(67.05)		(180.10)	(163.80)	(179.19)
Percent Population that is Elderly	70.93		1,465.85**	953.82	872.21
	(96.46)		(608.15)	(648.18)	(559.58)
Percent Population that is Immigrant	-24,589.81***		-15,794.80	10,361.93	12,790.63
	(4,915.05)		(45,623.84)	(45,405.97)	(41,351.56)
Percent Population that is Disabled	-88.70		-69.79	-123.13	-108.45
	(56.30)		(220.20)	(226.88)	(224.74)
Economic Variables					
Poverty Rate	1,110.16***			262.61	271.47*
	(95.18)			(158.34)	(152.16)
Percent Households on Cash Assistance	287.50*			410.18	453.69
	(147.16)			(405.91)	(401.63)
Minimum Wage (logarithm)	2,431.37***			-378.66	-467.62
	(606.29)			(676.37)	(641.41)
Per Capita Income (logarithm)	3,566.18**			-5848.59	-4629.54
	(1,430.35)			(4,697.58)	(4,413.12)
Policy Variables					
Simplified Reporting	2,702.73***				-1,044.90**
	(393.80)				(519.42)
Transitional Benefits	552.44***				124.78
	(187.87)				(273.87)

Table 4, continued

	(1)	(2)	(3)	(4)	(5)
Vehicle Exclusion	-10.42				375.42
	(186.27)				(297.21)
Categorical Eligibility	498.66**				-232.13
	(220.39)				(431.61)
Constant	-47,312.08***	6,518.63***	-17,025.76	50,278.50	39,795.00
	(16,523.12)	(516.83)	(12,054.00)	(54,628.40)	(51,782.62)
Observations	342	342	342	342	342
R-squared	0.886	0.911	0.919	0.926	0.929
***F*-statistics and *p*-values of Joint Hypotheses**					
Demographic variables			2.06*	0.75	0.91
			(0.086)	(0.590)	(0.484)
Economic variables				1.17	1.32
				(0.336)	(0.275)
Policy variables					1.51
					(0.213)

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

The key coefficients shown in Table 4 for the low-skilled unemployment rate indicate a consistently positive relationship between this variable and SNAP participation. Relative to the results in column (1), the statistical significance and positive sign of the coefficient for the low-skilled unemployment rate do not change when state and year fixed effects are included, although the magnitude does change. When the model is estimated with fixed effects but no control variables, as shown in column (2), the key coefficient is larger than the estimate in column (1) and is statistically significant at the one percent level. As controls are added to the regression model in columns (3) and (4), the magnitude of the coefficient decreases, but it remains statistically significant and positive. The full model in column (5), which contains all

control variables and employs fixed effects, shows a statistically significant coefficient of 65.02 at the 10 percent level. This coefficient indicates that a one percentage point increase in the unemployment rate of the low-skilled population is associated with an increase of about 65 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 consistency of the positive sign and statistical significance of the key coefficient across the five models suggests that the low-skilled unemployment rate affects SNAP participation. The results of the joint significance tests, shown in the bottom panel of Table 4, indicate that the demographic, economic, and policy variables are largely jointly insignificant. This suggests that they may have no effect on SNAP participation.

The effect of a one percentage point increase in the low-skilled unemployment rate on SNAP participation appears to be reasonably small. The descriptive statistics in Table 2 show that the average unemployment rate in the sample was nearly 13 percent with a standard deviation of four percentage points. Given this average, a one percentage point increase in the unemployment rate is a moderate shift in unemployment. Table 2 also shows that the average number of SNAP participants per month for every 100,000 people in a state was 10,649 with a standard deviation of 3,723. Given this variation, a change of 65 SNAP participants for every 100,000 people in a state is a miniscule shift in participation. These findings suggest that SNAP participation has a relatively small response to low-skilled unemployment rates.

Table 5 shows alternative functional form specifications of the main regression model, all of which employ fixed effects. Column (1) replicates the full model in column (5) of Table 4. The model in column (2) includes the square of the low-skilled unemployment rate to test

whether the relationship between low-skilled unemployment and SNAP participation is non-linear. The model in column (3) uses a one-year lag in the low-skilled unemployment rate to test for a possible relationship between SNAP participation and the low-skilled unemployment rate of the previous year. The model in column (4) tests whether the lagged relationship specified in column (3) is non-linear. The model in column (5) uses a two-year lag in the low-skilled unemployment rate, and the model in column (6) tests whether the effect of low-skilled unemployment on SNAP participation differed after 2008, when the 2008 Farm Bill was passed.

Table 5. Regression Results for Alternative Specifications

Dependent Variable	SNAP participation per 100,000 people in a state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
State and Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Key Independent Variable						
Low-skilled Unemployment Rate	65.02*	-118.39				16.34
	(35.83)	(70.71)				(40.22)
Squared Low-skilled Unemployment Rate		6.23**				
		(2.47)				
1-year Lagged Low-skilled Unemployment Rate			129.54**	-91.08		
			(55.00)	(71.83)		
Squared 1-year Lagged Low-skilled Unemployment Rate				7.28**		
				(2.72)		
2-year Lagged Low-skilled Unemployment Rate					88.93	
					(58.42)	
Low-skilled Unemployment * After 2008						65.22
						(40.45)
Demographic Variables						
Percent Population without High School Degree	176.63	224.04	237.90	261.07	45.27	195.01
	(207.68)	(210.85)	(230.58)	(238.97)	(240.25)	(212.01)
Percent Households with Children	6.80	62.96	99.26	210.44	-122.07	57.34
	(179.19)	(170.58)	(188.53)	(193.21)	(174.15)	(169.35)
Percent Population that is Elderly	872.21	675.86	976.40*	723.69	687.17	678.54
	(559.58)	(510.77)	(581.61)	(527.54)	(663.93)	(538.69)
Percent Population that is Immigrant	12,790.63	538.32	20,663.15	11,823.34	19,454.67	2,954.78
	(41,351.56)	(38,698.05)	(43,838.64)	(41,068.89)	(43,832.46)	(38,891.85)
Percent Population that is Disabled	-108.45	-110.19	-173.37	-183.17	-262.87	-94.25
	(224.74)	(215.00)	(245.65)	(229.56)	(247.81)	(220.63)
Economic Variables						
Poverty Rate	271.47*	265.83*	287.71	295.54*	269.76	268.14*
	(152.16)	(146.68)	(175.14)	(173.08)	(176.39)	(148.34)
Percent Households on Cash Assistance	453.69	442.76	474.81	462.20	333.22	444.48
	(401.63)	(401.64)	(396.24)	(394.03)	(368.34)	(409.94)
Minimum Wage (logarithm)	-467.62	-421.54	-378.81	-393.68	-295.44	-383.59
	(641.41)	(659.41)	(826.33)	(826.63)	(920.33)	(650.06)

Table 5, continued

	(1)	(2)	(3)	(4)	(5)	(6)
Per Capita Income (logarithm)	-4,629.54 (4,413.12)	-3,779.87 (4,458.77)	-392.47 (4,085.58)	-1,092.79 (4,241.33)	-7,017.17 (5,259.90)	-3,997.37 (4,429.49)
Policy Variables						
Simplified Reporting	-1,044.90** (519.42)	-1,000.19* (514.75)	-1,234.52* (722.43)	-1,190.54* (698.30)	-1,651.45* (877.67)	-1,007.14* (521.56)
Transitional Benefits	124.78 (273.87)	127.86 (264.31)	106.05 (338.21)	12.16 (461.18)	-479.46* (263.24)	133.34 (258.61)
Vehicle Exclusion	375.42 (297.21)	422.95 (295.94)	534.33 (337.43)	583.67* (336.32)	842.34** (387.68)	400.66 (298.12)
Categorical Eligibility	-232.13 (431.61)	-245.41 (421.35)	-273.57 (411.81)	-287.60 (383.60)	-487.97 (412.55)	-250.71 (430.32)
Constant	39,795.00 (51,782.62)	33,000.66 (52,583.72)	-9,767.26 (45,978.33)	-1,098.69 (47,621.93)	74,646.91 (58,579.84)	34,645.75 (52,358.00)
Observations	342	342	291	291	240	342
R-squared	0.929	0.931	0.936	0.939	0.942	0.930
***F*-statistics and *p*-values of Joint Hypotheses**						
Squared and Linear Untransformed Unemployment Rates		3.99** (0.025)				
1-Year Lagged Squared and Linear Untransformed Unemployment Rates				4.25** (0.020)		
Low-skilled Unemployment * After 2008 And Untransformed Unemployment Rate						2.43* (0.098)
Inflection point		9.50*** (2.870)		6.25* (3.517)		

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

The results from Table 5 indicate that SNAP participation may have a non-linear relationship with the contemporaneous low-skilled unemployment rate and with the low-skilled unemployment rate of the previous year. Column (2) indicates that the coefficient for the squared low-skilled unemployment rate is positive and statistically significant at the five percent

level, while the untransformed unemployment rate becomes statistically insignificant and negative. Column (2) also shows that the coefficients for the unemployment rate and the squared rate are jointly significant at the five percent level. These results suggest that the correlation between SNAP participation and the unemployment rate is initially negative then becomes positive at some point in the unemployment rate distribution. The second to last row in column (2) shows that this "inflection point" occurs at the low-skilled unemployment rate of 9.5 percent, which is below the average rate of 13 percent shown in Table 2.[12] The standard errors show that the confidence interval for this estimate is reasonably wide, so the actual inflection point may differ from the estimate reported here.

The results from column (3) suggest that SNAP participation is correlated with the low-skilled unemployment rate of the previous year. The coefficient for the lagged unemployment rate is positive and statistically significant at the five percent level. Its magnitude is about twice that of the contemporaneous rate: a one percentage point increase in the unemployment rate of the previous year is associated with an increase of nearly 130 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. Column (4) shows that the coefficient for the squared one-year lagged unemployment rate is positive and statistically significant at the five percent level. The results for this specification also indicate that the coefficients for the one-year lagged and squared lagged rates are jointly significant at the five percent level. These results suggest that, as with the contemporaneous rate, SNAP participation is negatively correlated with the lagged unemployment rate then becomes positively correlated at some point in the unemployment rate

[12] 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.

distribution. The second to last row in column (4) shows that this correlation changes at the lagged unemployment rate of 6.3 percent, although the standard errors for this estimate show that it is quite imprecisely estimated.

In contrast to the one-year lagged rate, the results of the model in column (5) show that SNAP participation has no statistically significant relationship with the two-year lagged low-skilled unemployment rate. Column (6) shows the results of a regression that tests whether the effect of low-skilled unemployment differed after the passage of the 2008 Farm Bill. The coefficient for the interaction term is positive, and the coefficients for the interaction term and the unemployment rate are jointly significant at the 10 percent level. These findings suggest that the effect of low-skilled unemployment on SNAP participation was stronger after the Bill's enactment.

Although the control variables are not the focus of this paper, Tables 4 and 5 show that the controls are largely individually statistically insignificant across the different model specifications. One exception is the adoption of simplified reporting, whose coefficient is consistently negative and statistically significant across all model specifications in Table 5. These results are puzzling because the adoption of simplified reporting is intended to simplify the process of certifying SNAP benefits for recipients. In theory, this policy 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 lagged and contemporaneous effect on SNAP participation and that the lagged effect is larger than the contemporaneous one. Furthermore, the relationship is non-linear. These findings are

robust to changes in the main regression model. I conducted robustness checks to test the sensitivity of the results to the inclusion of overall state employment rates in the main model. I also tested the sensitivity of the results to the exclusion of the percentage of low-skilled individuals in a state from the model. These tests were performed because of the mechanical correlation of these variables with the low-skilled unemployment rate. In another sensitivity test, I excluded from the model the variable measuring the percentage of the state population that is disabled. This test was conducted because the ACS changed the way that this variable was measured during the time period in my study. This variable was included in my main analysis because it is correlated with SNAP participation, and its exclusion could bias the estimates of the key coefficient.

The results of these robustness checks appear in the Appendix. They show that the estimated effect of low-skilled unemployment on SNAP participation is consistent across variations of the main model. These findings therefore confirm the measurable but relatively small response of SNAP to low-skilled unemployment.

DISCUSSION

Major Findings

My empirical analyses tested the hypothesis that food stamp participation and the state-level unemployment rates of the low-skilled population are positively correlated. The main regression results confirm this hypothesis. As predicted, when state-level unemployment rates of this segment of the population increase, so does food stamp participation. This suggests that SNAP is responsive to changes in the unemployment rate of disadvantaged groups, although the response is small. A one percentage point increase in the low-skilled unemployment rate is associated with an increase of 65 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. As reported in the Descriptive Statistics section, the per capita average number of SNAP participants in the sample is 10,649 per month for every 100,000 people in a state; this is equivalent to an average of 1.3 million SNAP participants per month in a state in the sample. An estimated increase of 65 participants represents an increase in average participation of less than one percent, which suggests that an increase in low-skilled unemployment does not, by itself, result in a notable take-up of food stamps by this segment of the population.

I also find that this relationship is non-linear; that is, the amount by which SNAP participation increases in response to changes in low-skilled unemployment depends on the initial low-skilled unemployment rate. In an ordered distribution of the low-skilled unemployment rates in the sample, the rate at the 25^{th} percentile is 9.6 percent; the median rate is 11.9 percent; and the rate at the 75^{th} 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 one participant; by about 29 recipients; and by about 83 participants, respectively, for every 100,000 people in a state. At the average low-skilled unemployment rate in the sample of nearly 13 percent, which is about a percentage point higher than the median rate, SNAP participation is predicted to increase by approximately 43 participants for every 100,000 people in a state, in response to a one percentage point increase in the low-skilled unemployment rate. This indicates that the rate at which low-skilled individuals take up SNAP benefits 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 a year prior and that the effect of the one-year lagged unemployment rate is larger than that of the contemporaneous rate. These findings suggest that some low-skilled individuals do not immediately act on the effects of unemployment, even though they may feel them. They may wait a period of time as their savings and other resources dwindle before actually turning to SNAP for assistance. As with the contemporaneous change in low-skilled unemployment, the size of the increase in SNAP participation in response to changes in low-skilled unemployment depends on the initial level of the unemployment rate a year prior.

Using the same three percentiles that were used in the non-linear model for the contemporaneous rate, the non-linear model with a lagged unemployment rate predicts an increase in SNAP participation of about 48 recipients; about 82 participants; and about 144 recipients respectively, for every 100,000 people in a state in response to a one percentage point increase in the low-skilled unemployment rate. At the average contemporaneous rate of nearly 13 percent, the non-linear model with a lagged rate predicts an increase of about 97 participants

per 100,000 people in a state in response to a one percentage point increase in the low-skilled unemployment rate. This indicates that the rate at which low-skilled individuals take up SNAP benefits increases as the lagged unemployment rate of this group rises.

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 legislative changes made to the SNAP program. As noted in the Literature Review section, the 2008 Farm Bill and the 2009 American Reinvestment and Recovery Act expanded eligibility for SNAP benefits. The results appear to confirm that these changes helped to make SNAP more responsive to the unmet economic needs of low-skilled individuals.

Comparison with Previous Literature

The results from my analysis are not directly comparable to the findings of previous research, as that research has focused on the relationship between SNAP participation and the overall unemployment rate, rather than that of low-skilled individuals. Nevertheless, as discussed in the Literature Review section, several studies have confirmed that SNAP operates counter-cyclically as intended. As the economy weakens, SNAP participation rises. Previous researchers are consistent in their estimates of the change in SNAP participation. 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 for the years between 2000 and 2006. Similarly, Klerman and Danielson (2011) found an increase of about four percent in SNAP caseloads for a one percentage point increase in the overall unemployment rate for the period between 1989 and 2009. Bitler and Hoynes (2010) estimated an increase of nearly five percent

in food stamp caseloads for a one percentage point increase in the overall unemployment rate for the period between 1980 and 2009. Mabli and Ferrerosa (2010) estimated that the number of SNAP participants as a share of the state population increased by nearly four percent for a one percentage point increase in the overall unemployment rate between 2000 and 2008. All of these previous studies employed fixed effects specifications with state-level panel data. My regression results are consistent with the signs of these coefficients, indicating that SNAP is performing as intended for low-skilled individuals.

I use the coefficients from the two studies by Mabli et al. (2009) and Mabli and Ferrerosa (2010) to construct ballpark estimates of the elasticity of SNAP participation with respect to overall unemployment rates. These studies are chosen because the time periods used in their analyses overlap with the time period in my analysis and the number of years covered is roughly comparable. To construct my estimates, I use unemployment data from the U.S. 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 0.2. Employing the same method for the results of my analysis, I estimate an elasticity of roughly 0.08. This indicates that the effect of changes in the low-skilled unemployment rate on SNAP participation is approximately 40 percent as large as the effect of the overall unemployment rate.

The relatively small size of this elasticity is puzzling, as one might expect SNAP to be more responsive to low-skilled unemployment rates than to overall unemployment rates.[13] Moreover, exploratory analyses indicate that the overall unemployment and low-skilled unemployment rates are highly correlated during the time period in my study, which suggests that they should have similar effects on SNAP participation.

Other exploratory analyses demonstrate that the small size of the elasticity estimated from my results is a function of my choice of control variables. Unlike Mabli et al. (2009) and Mabli and Ferrerosa (2010), my regression model controls for the state poverty rate, state per capita income, and the percentage of households on cash assistance. The exclusion of these controls in the previously cited research can be plausibly explained by the fact that poverty and income are mediating factors that link unemployment to SNAP participation. From this perspective, controlling for these factors is problematic because they constitute the mechanism through which low-skilled unemployment rates affect participation. However, I included these variables as controls in my model under the assumption that poverty and per capita income have an effect on participation that is independent of the relationship between unemployment and participation. Poverty and income are closely related, and income is partly a function of wages and hours worked. Including per capita income in my model specification therefore controls in part for changes in hours worked that may affect SNAP participation, independent of the effects of employment and wages.

Similarly, the percentage of households on cash assistance is included to account for the independent effect of participation in public assistance programs on SNAP benefit receipt. As

[13] 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 U.S. Department of Agriculture does not publish such data.

noted in the Conceptual Framework section, TANF households are among the groups of recipients that participate in SNAP at high rates. Excluding these three controls from my regression yields an elasticity that is comparable to the estimates referenced above from the cited studies.

My findings are largely consistent with the results of previous studies that report evidence of a lag in the effect of unemployment on SNAP participation. Mabli et al. (2009) and Mabli and Ferrerosa (2010) found that participation increased by about six percent for a one percentage point increase in the overall one-year lagged unemployment rate, as opposed to nearly four percent for the same increase in the contemporaneous rate. Ballpark estimates of the elasticity of SNAP participation in response to lagged unemployment rates, calculated from these studies and my analysis, indicate that the effect of changes in the lagged low-skilled unemployment rate on participation is approximately half as large as the effect of the lagged overall unemployment rate.

Policy Implications and Analytical Limitations

The results of my analysis are a mixed bag for advocates and critics of the SNAP program. The small effect of low-skilled unemployment on SNAP participation may reflect the fact that unemployed individuals may simultaneously take advantage of SNAP and other options available for public assistance, such as unemployment insurance. 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 at least 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

economic 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 on both sides when drawing conclusions about the utility of the program. The program's advocates and detractors alike should remain aware that, since much of the shift in SNAP participation does not immediately follow changes in economic conditions for low-skilled individuals, the effects of benefit receipt are unlikely to emerge for a period of time.

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, the ease of applying for benefits, the level of stigma associated with food stamp benefits, and individual expectations about future income. Eligible individuals may incorrectly perceive that they are ineligible for SNAP benefits and therefore may decide not to apply (Bartlett et al., 2004). Potentially eligible individuals may be deterred from applying for benefits if their local food stamp offices are geographically distant, cannot be reached by public transportation, or are not child-friendly (Bartlett et al., 2004). Furthermore, some eligible individuals who expect their lower income levels to be temporary may not seek SNAP benefits (Farrell et al., 2003). These expectations may also vary with the status of the economy: individuals may be more likely to believe that their lower income levels are temporary if the economy is doing well. Stigma may

also be a hurdle to participation, as eligible individuals may avoid using the SNAP program due to negative perceptions attached to obtaining government aid (Bartlett et al., 2004).

Another variable that is excluded from my analysis is federal outreach expenditures. These are federal grants provided to states to encourage eligible individuals to apply for SNAP benefits. Previous research has found a positive correlation between these outreach expenses and SNAP participation among elderly-only households, adults-only households, and the poorest households (Mabli & Ferrerosa, 2010). This variable was excluded from the regression analysis due to the practical difficulty in accurately measuring it, as noted in the Conceptual Framework section.

The exclusion of these factors may bias the key coefficient in my regression results. Geographic distance and the inaccessibility of local food stamp offices by public transportation may be negatively correlated with SNAP participation. They may also be negatively correlated with unemployment rates if areas with higher low-skilled unemployment rates have more local food stamp offices. The level of "child-friendliness" of food stamp offices may be positively correlated with SNAP participation, as it may ease the experiences of unemployed applicants at the local food stamp office and make it easier for them to apply for benefits. Food stamp offices may be more likely to institute child-friendly policies if they are located in areas of high unemployment, in order to accommodate unemployed applicants who cannot afford baby-sitting for their children.

In addition, optimism about future economic circumstances is likely to be both negatively correlated with SNAP participation and with unemployment. Finally, outreach expenses are likely to be positively correlated with SNAP participation and with low-skilled unemployment

and to vary over time and across states. The omission of state-level versions of most of these factors may positively bias the coefficient for the low-skilled unemployment rate on SNAP participation. In contrast, the omission of stigma is unlikely to exert much bias; although stigma is likely to be negatively correlated with SNAP participation, it likely has little relationship with an individual's employment status.

Conclusion

My results point to potential directions for future research. New studies can uncover with more precision how long low-skilled individuals tend to wait before taking up SNAP benefits. Furthermore, an auxiliary finding of my study is that only one of the four policy variables, simplified reporting, had a statistically significant and negative relationship with SNAP participation across the different models. This contradicts the goal of the policy options, which were implemented in order to encourage participation. This result presents another potential avenue for new exploratory research on the effects of SNAP policy options.

In conclusion, my analysis shows that participation in the Supplemental Nutrition Assistance Program increases as the unemployment rate rises among low-skilled individuals. My analysis also suggests that the growth rate of SNAP participation increases as low-skilled unemployment rises and that there is some lag in the relationship between participation and low-skilled unemployment. 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 smaller than the effect of the overall unemployment rate as reported in prior studies. These results exemplify the continuing need to study the factors that are associated with SNAP

participation; understanding the dynamics of participation can help to pinpoint more precisely how SNAP receipt is related to poverty and 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.

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 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. Since this variable and the low-skilled unemployment rate are mechanically correlated, its inclusion in the main regression model may affect the key coefficient. Column (3) of the same table shows a regression model that 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.[14] This control variable was previously excluded from the main regression model due to its mechanical correlation with the low-skilled unemployment rate. Finally, the regression model in column (4) of Table 6 omits the control variable that measures the percentage of the state population that is disabled. As noted in Table 1, 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 models when the actual adjusted minimum

[14] The employment rate is obtained from the U.S. 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 (U.S. Census Bureau, 2012).

wage and adjusted per capita income are included, rather than their logarithms. 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.

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 Unemployment Rate	65.02*	58.37	58.58*	65.56*
	(35.83)	(37.18)	(34.82)	(34.68)
Demographic Variables				
Percent Population without High School Degree	176.63		183.69	137.33
	(207.68)		(204.69)	(185.79)
Percent Households with Children	6.80	0.40	4.90	10.14
	(179.19)	(178.19)	(179.15)	(181.00)
Percent Population that is Elderly	872.21	797.83	815.56	847.48
	(559.58)	(558.10)	(589.52)	(569.87)
Percent Population that is Immigrant	12,790.63	11,391.36	13,315.11	13,645.70
	(41,351.56)	(39,674.11)	(41,215.39)	(40,724.22)
Percent Population that is Disabled	-108.45	-44.72	-100.38	
	(224.74)	(204.58)	(223.33)	
Economic Variables				
Employment Rate			-58.79	
			(153.02)	
Poverty Rate	271.47*	289.47*	255.83	269.03*
	(152.16)	(154.05)	(160.53)	(149.39)
Percent Households on Cash Assistance	453.69	467.49	450.45	433.20
	(401.63)	(414.95)	(398.36)	(399.83)
Minimum Wage (logarithm)	-467.62	-609.33	-457.41	-517.60
	(641.41)	(719.74)	(651.51)	(642.07)
Per Capita Income (logarithm)	-4,629.54	-4,975.08	-3,723.13	-4,575.84
	(4,413.12)	(4,208.42)	(4,888.53)	(4,435.70)
Policy Variables				
Simplified Reporting	-1,044.90**	-1,025.98*	-1,042.47**	-1,080.42**
	(519.42)	(518.48)	(514.19)	(523.81)
Transitional Benefits	124.78	82.09	122.04	116.44
	(273.87)	(278.50)	(271.07)	(273.90)

Table 6, continued

	(1)	(2)	(3)	(4)
Vehicle Exclusion	375.42	391.94	376.64	389.30
	(297.21)	(295.08)	(296.57)	(292.63)
Categorical Eligibility	-232.13	-192.91	-230.23	-216.08
	(431.61)	(461.05)	(432.40)	(440.50)
Constant	39,795.00	46,411.85	34,822.52	38,569.22
	(51,782.62)	(48,254.19)	(52,916.15)	(52,289.50)
Observations	342	342	342	342
R-squared	0.929	0.928	0.929	0.929
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 7. Additional Sensitivity Analysis

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 Unemployment Rate	54.02	89.76***	79.56**
	(32.70)	(33.17)	(35.22)
Demographic Variables			
Percent Population without High School Degree	-32.06	37.82	202.12
	(239.63)	(134.94)	(207.82)
Percent Households with Children	167.97	97.30	28.01
	(182.77)	(102.63)	(181.84)
Percent Population that is Elderly	878.92*	896.95**	980.18
	(518.66)	(373.87)	(587.41)
Percent Population that is Immigrant	-5,812.78	-29,985.99	7,996.61
	(39,829.80)	(21,966.49)	(39,339.73)
Percent Population that is Disabled	-57.74	-4.52	-97.74
	(200.98)	(131.50)	(226.57)
Economic Variables			
Poverty Rate	143.44	241.75**	414.94***
	(185.20)	(110.94)	(151.88)
Percent Households on Cash Assistance	734.57*	500.03*	511.72
	(400.54)	(265.57)	(389.36)
Minimum Wage (logarithm)	-567.4	-389.17	
	(547.31)	(593.41)	
Per Capita Income (logarithm)	-5,468.38	-3,474.15	
	(4,923.91)	(3,289.97)	
Minimum Wage			-81.24
			(118.97)
Per Capita Income			0.121
			(0.16)
Policy Variables			
Simplified Reporting		-178.41	-1,162.76**
		(500.64)	(508.61)

Table 7, continued

	(1)	(2)	(3)
Transitional Benefits		74.48	171.44
		(361.35)	(264.08)
Vehicle Exclusion		182.93	399.24
		(260.94)	(309.94)
Categorical Eligibility		403.08	-208.32
		(282.66)	(428.39)
Policy Variables before imputation			
Simplified Reporting	-757.57*		
	(403.09)		
Transitional Benefits	302.32		
	(245.41)		
Vehicle Exclusion	203.4		
	(273.82)		
Categorical Eligibility	-49.61		
	(383.72)		
Constant	47,994.31	26,769.50	-15,903.48
	(57,298.27)	(35,781.75)	(14,980.64)
Observations	255	342	342
R-squared	0.914	0.922	0.929
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

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