

eligibles are not utilizing both programs, we can begin to look for ways to improve the efficiency and effectiveness of both the EITC and FSP.

Third, models 1 and 2 incorporate both measures of program implementation and macroeconomic measures as discussed in prior studies and add additional measures of *individual* program participation, benefits received, and employment status. In some cases, introducing individual characteristics into our models explains away the relationship between macro variables and food stamp participation.<sup>11</sup>

### III. Study Population and Econometric Models

Supplementary benefits such as food stamps are a key component of the U.S. strategy for moving welfare recipients to work. As discussed above, however, in recent years the proportion of eligible families actually receiving food stamps has declined sharply. The studies discussed in Section II suggest that about half of this decline in food stamp participation can be explained by welfare reform and the expanding economy of the 1990s. Thus, about half of the decline remains unexplained.

The expansion of the EITC remains an unexplored factor that may have significantly affected food stamp participation during the 1990s. However, as we discuss in Section IV, our data are for the latter half of the 1990s after the vast majority of the EITC expansion occurred. One source of variation that we can exploit stems from the varying amounts of EITC a household may be eligible for due to changes in household size. As Figure 2 shows, EITC is offered at three levels—to households with no children, to households with one child, and to households with two or more children. On the other hand, food stamps are offered in increasing amounts as household size increases beyond three or four persons. Thus, going from one to two children increases both EITC and food stamp eligibility, while increases from two to three children raise only food stamp but not EITC eligibility. Consider one-parent families with earnings of \$800 per month and from one to three children. Each additional child raises food stamp benefits by about \$1,200 (\$1,294 for the second and \$1,152 for the third child). Since EITC amounts do not reduce food-stamp eligibility (or gross food stamp benefits), we might expect that the rise in food stamp participation in moving from one to two children should be as high as the rise in participation in moving from two to three children. However, because of EITC, household

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<sup>11</sup> The statistical significance of the aggregate variables (e.g., state unemployment rate) should be interpreted cautiously because, as Moulton (1990) points out, there is some possibility that the estimates of the standard errors for these aggregate coefficients are biased downward.

income is higher for two-child families than for one-child families, but the addition of a third child does not raise household income. One mechanism by which EITC income can lower participation in FSP can be observed by comparing the change in FSP participation from one- to two-child families with the change from two- to three-child families. By exploiting this and other variations in both household size and income, we examine how EITC receipt affects FSP participation rates.

Another approach is to examine whether changes in EITC income induce the same or less of a decline in participation than changes in earned income. Again, since higher earnings lowers benefit amount but EITC does not, we might expect higher earnings to lower participation but higher EITC to not lower participation. This question is difficult to test because EITC generally changes with earnings. We can take advantage of the non-linear relationship between earnings and EITC. If EITC had no effect, we would expect higher earnings to lower participation by the same amount whether EITC increases, remains unchanged or decreases. On the other hand, if EITC exerts an independent, negative effect on participation, then increases in earnings that raise EITC amounts should lower participation more than increases in earnings that leave EITC unchanged or reduce EITC.

A final approach is to exploit the seasonal variation in EITC receipt. Over 98 percent of EITC claimants receive their EITC benefits in a lump sum,<sup>12</sup> usually during the first or early in the second trimester of the year. Given that the EITC may be over \$4,000 for some low-income families with two or more children, it is plausible that any effect of the EITC on food stamp participation is greater in the months around when the lump sum is received. To determine if the timing of the receipt of EITC benefits impacts food stamp receipt, we measure whether federal EITC receipt has a seasonal effect on food stamp participation.

### **Study Population**

We limit our study population to working-age parents living in low-income households who are likely to meet the income and asset eligibility criteria for the Food Stamp Program.<sup>13</sup> To do this,

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<sup>12</sup> Hotz, V. Joseph and John Karl Scholz. 2000. *The Earned Income Tax Credit*. Paper for the NBER Conference on Means-Tested Transfers, July, p. 54.

<sup>13</sup> Poverty thresholds are determined using *family* size, and the EITC is determined on the basis of the filing unit income and presence and number of children. The FSP provides benefits based on *household* size, and our unit of analysis in the SIPP data is *household* heads. However, in determining eligible EITC benefits, we used information on expected filing units (information on individuals, on spouses, where appropriate, and on the resident children living with individuals and any spouses. In this paper, though we sometimes use individuals and married couples, we use the term household in describing our results.

our study population is limited to low-income household heads ages 18 to 60 with children present in the household. For this analysis, a household is defined as low income if the household is below 130 percent of the poverty line and if household assets are less than or equal to \$2,000, or \$3,000 if at least one household member is age 60 or older.<sup>14</sup> By using both income and assets to limit the population, we more closely approximate low-income households that may be eligible for food stamps than by using income by itself.<sup>15</sup> Our study population includes household heads observed living in a low-income household with children *in any month* so that the population does not change over the 1996 SIPP panel.

### ***Econometric Models***

Our empirical analysis examines how federal EITC benefits affect FSP participation between 1996 and 1999. We build on prior research by estimating the following three models while controlling for factors that have already been examined in prior research such as the impact of the macroeconomy, implementation of TANF, etc. (Currie and Grogger 2001; Ziliak, Gunderson, and Figlio 2001; Figlio, Gunderson, and Ziliak 2000).

Each of the three models examines a different aspect of the EITC—actual EITC benefits claimed (model 1), EITC benefits a household is eligible for (model 2), and a natural experiment exploiting the variation in the flat portion of the EITC benefits schedule between households of the same size with either one or two children (model 3).

#### Model 1: The Relationship Between Actual Federal EITC Benefits Claimed and Food Stamp Program Participation Considering State EIC Implementation

We use a logit model to examine the relationship between actual federal EITC claimed and FSP participation. Our dependent variable is Food Stamp Program participation which equals one if a household head participates in the FSP during a given month and zero otherwise. Our primary independent variable of interest is actual federal EITC claimed by the household head.

We also consider the impact of refundable state EIC programs using a state-level variable measuring whether and in what year a refundable EIC program was implemented for each state. While previous research (see Currie and Grogger 2001) indicates that variation between state

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<sup>14</sup> Assets include checking, savings, and bonds as measured in the topical modules of the 1996 SIPP panel for waves 3, 6, 9, and 12. Asset information for each available wave is repeated for prior waves.

<sup>15</sup> Using asset levels to determine FSP eligibility since prior research using the SIPP (see Daponte, Sanders, and Taylor 1999; Blank and Ruggles 1996) indicates that adding the asset test raises the estimated FSP take-up rates and that take-up rates calculated without asset measures may be inaccurate.

EIC rules and federal EITC changes over time may not be dramatic, we do include a variable to capture state-level variation. Recall that a refundable state EIC provides a credit to a household in excess of any state income taxes owed while a non-refundable EIC may eliminate a household's state income tax burden but does not provide a state income tax refund.<sup>16</sup>

The probability of FSP participation for household  $i$  living in state  $s$  in month  $m$  of year  $y$  is a function of his or her EITC and EIC receipt in the previous year and control variables in the current month:

$$\textit{Probability of FSP Participation}_{ismy} = F(E_{isy-1}, X_{ismy})$$

where  $F$  is a logistic function.<sup>17</sup>

The vector  $E$  represents the EITC-related variables including:

- Actual EITC benefits claimed; and
- Implementation of refundable state EIC programs.

The vector  $X$  represents variables other than the EITC that may affect food stamp participation (control variables) including:

- Macroeconomic variables;
- Welfare program variables;
- Demographic variables;
- Employment status variables;
- Income and assets variables;
- Implementation of statewide Electronic Benefits Transfer (EBT) programs; and

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<sup>16</sup> For very low-income households (e.g., those leaving welfare and entering the workforce) a non-refundable EIC may not provide a significant financial benefit since their state income tax burden is likely to be low or nonexistent. Moreover, states without an income tax are *more* generous to low-income households than states with a non-refundable EIC programs but are *less* generous than states with refundable EIC programs.

<sup>17</sup> The logistic function  $F(Z)$  is given by  $\exp(z)/[1+\exp(z)]$ .

- Political affiliation of the state’s governor.

We present a reduced form of model 1 excluding variables that may be endogenous (e.g., employment status, spousal employment status, TANF participation, and actual TANF benefits received). Specifically, we are concerned about the endogeneity of a household head’s employment status, for example, which may simultaneously affect the likelihood of participating in the FSP and be affected by EITC. We then present the full form of model 1 including these potentially endogenous variables (see Table 3).

Finally, to determine if the timing of the receipt of EITC benefits impacts food stamp receipt, we also investigate whether federal EITC receipt has a seasonal effect. We do this by running an alternate version of the full form model 1 using trimester variables interacted with actual EITC benefits claimed (see Table 4). The variables are described in detail in Section IV below.

#### Model 2: The Relationship Between Computed EITC Benefits a Household is Eligible for and Food Stamp Program Participation Considering State EIC Implementation

In our second model, we replace actual EITC benefits claimed with a computed variable measuring the EITC benefits a household should be eligible for given their household size and earned income. All other variables in model 2 remain the same as in model 1. A description of how EITC benefits were computed for each household is given in Section IV below.

We use the second model in case actual EITC benefits are not completely exogenous. That is, since we believe it is possible that some unobserved variables may affect both the likelihood of participating in the FSP and of receiving EITC, we are concerned that using actual EITC benefits would result in biased and inconsistent estimates. For example, knowledge about federal income support programs is an unobservable factor that may make a household more likely to participate in food stamps and receive EITC. We tested this by regressing actual EITC benefits on the computed EITC benefits (plus our other control variables) and then including the residuals from this regression in an ordinary least squares regression of food stamp participation on actual EITC benefits and our controls.<sup>18</sup> While our results did not conclusively demonstrate that there was an endogeneity problem with using actual EITC benefits, they did suggest it was possible.

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<sup>18</sup> We use Stata’s Hausman command to test whether the differences between the instrumental variables two-stage least squares (2SLS) regression and ordinary least squares (OLS) estimates are large enough to suggest that the OLS estimates are not consistent. Our results indicate that there is not a significant difference between the 2SLS and the OLS coefficients, indicating that OLS is not an inconsistent estimator in this equation.

For model 2, we present both reduced and full form results (see Table 5). We also present results for an alternate version of model 2 using trimester variables interacted with computed EITC benefits claimed (see Table 6).<sup>19</sup>

### Model 3: Difference-in-Difference Approach to Examining the Role of EITC in Affecting Food Stamp Participation

This model builds on the idea that EITC may reduce food stamp participation by reducing the urgency of claiming benefits without reducing potential food stamp benefits. The difference-in-difference approach provides a way of examining this possibility by distinguishing between differences in earnings that raise EITC benefits and differences in earnings that do not raise EITC benefits. Because the flat portion of the EITC schedule varies with the number of children, we compare households in which the same increase in earnings yields different changes in EITC. For example, we compare households with one child with households with two children (but the same household size) over earning ranges in which EITC remains constant in the one-child case but increases in the two-child case. If EITC benefits exert an impact despite having no effect on food stamp eligibility, then we would expect that food stamp participation to fall in the two-child case by more than the decline in the one-child case.

To operationalize this model, we specify the differences in group means that capture potential EITC impacts of food stamp participation as a function of earnings gains associated with and not associated with increases in EITC. We divide households into earnings and income ranges where earnings increases do and do not add to EITC. We then calculate how food stamp participation rates change with earnings between and within these ranges, and take the difference in changes in food stamp participation rates between those whose EITC increases and those whose EITC does not increase.

Using 2001 figures, we divide households into the following earnings ranges by number of children. Within each range, we divide households into groups based on increments to earnings.

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<sup>19</sup> As an alternative specification for models 1 and 2, we also ran the logits separately depending on whether a household fell on the increasing, flat, or decreasing portion of the EITC curve (review Figure 2 to see the structure of the EITC curve). For example, a household eligible for \$200 in EITC income could be either on the increasing part of the EITC curve (indicating a low household income) or the decreasing part of the curve (indicating a higher household income). Therefore, we split the sample into thirds depending on annual household income in each year and the number of children in the household. When we ran the regressions for model 1 and 2 on each of these three samples, the small number of observations resulted in few significant relationships.

<b>Earnings Range</b>	<b>EITC rules</b>
\$0-\$7,499	EITC increases for all households with children over this range
\$7,500-\$9,999	EITC is constant for households with one child, but increases for households with more than one child
\$10,000-\$12,999	EITC is constant for all households in this range
\$13,000+	EITC declines with added earnings over this range

Since EITC does not affect food stamp benefits, the added EITC income can only affect households by influencing their need for food stamps, not their potential benefits.

The difference-in-difference comparisons are as follows. Let  $P_{ijk}$  = percentage of each household group that participates in the FSP  $i$  (where  $i = 1, 2,$  and  $3$  based on the number of children in the household), earnings group  $j$ , where  $j = 0, 1, 2,$  and  $3$  based on the classifications listed in the table, and  $k$  is the number of changes in earnings above the bottom of the initial level (say, a  $k$  of  $3$  in earnings group  $2$  would be \$1,000-\$1,500 above \$7,500); and  $E_{ijk}$  = average earnings of household group  $i$  in earnings group  $j$  and at the  $k$ th increment to earnings.

To identify whether EITC affects food stamp participation, we first calculate the difference in the food stamp participation rate ( $P$ ) between each range  $j$ . We then specify the average change in  $P$  divided by the average change in earnings within each range and for each household type. We then compute the difference in the average changes in  $P$  relative to  $E$  between households with one, two, and three children. If EITC dollars reduced food stamp benefits there, we would expect to observe a larger decline in  $P$  relative to  $E$  for households with two children than for households with one child when earnings increases over the range  $j = 2$  (\$7,500-\$9,999), but not over the ranges  $j = 1$  or  $j = 3$ . Further, we should observe no difference in these ranges between households with two children versus households with three children. We make these comparisons based on current year earnings in each of three years (1997, 1998, and 1999) and the food stamp participation rate over the year (the share of eligible months households received food stamps) as the food stamp participation specification.

A second strategy is to estimate regressions based on spline functions that divide the impact of earnings on food stamp participation rates into several distinct effects that can vary within earnings segments. As above, the five earnings segments are determined by the way the EITC varies with earnings for each household type. In the first segment, EITC increases with earnings for all families with children. In the second segment of earnings, each \$1 of earnings adds 40 percent of a \$1 in added EITC for families with two or more children but adds nothing to EITC for families with only one child. If EITC were to exert an independent and negative effect on

food stamp participation, then we should observe a larger decline in participation per dollar of earnings over this range of earnings for families with two or more children than for one-child families. The third range is the area where EITC remains constant with each \$1 of earnings. In the subsequent two segments, EITC declines with each added \$1 of earnings, but phases out more quickly for one-child families. Under the spline function, the slopes are constrained in a way that insures continuity. With the regression strategy, we can simultaneously test for separate earnings effects while holding constant for other independent factors influencing food stamp participation.

#### **IV. Data**

##### ***Survey of Income and Program Participation***

We use the 1996 panel of the Survey of Income and Program Participation (SIPP) as our primary data source. The SIPP is a large-scale, national survey sponsored by the U.S. Census Bureau. The SIPP collects information about sources and amounts of income, labor force information, program participation, and demographic characteristics. The SIPP is designed “to measure the effectiveness of existing federal, state, and local programs; to estimate future costs and coverage for government programs, such as food stamps; and to provide improved statistics on the distribution of income in the country.”<sup>20</sup> In addition to the SIPP, we supplement our analyses with state-level information including: state EIC implementation, monthly state unemployment rates, annual state employment growth rates, Electronic Benefits Transfer (EBT), TANF implementation, and political affiliation of states’ governors. These additional variables and their sources are discussed in greater detail below.

The SIPP’s core survey collects monthly information from a stratified sample of the U.S. civilian noninstitutionalized population. The core questions collect information pertaining to the labor force participation, program participation, and income questions which help measure the nation’s economic situation. The 1996 panel includes interview data from December 1995 through March 2000 and has a sample size of 40,188 households. Household members are interviewed in four-month intervals—where each 4-month period is called a “wave”—and information is collected for each of the preceding four months.

The SIPP supplements the core survey in each wave with detailed topical modules that provide information including but not limited to past participation in the Food Stamp Program. Another