civilian population over 16 years of age[30] using data available through the U.S. Bureau of Labor Statistics.

Demographic Characteristics. Demographic characteristics are measured for the household head in each month. Age is measured as a continuous variable. Race and ethnicity are measured with indicators for whether the household head is non-Hispanic black, non-Hispanic other, and Hispanic, where non-Hispanic white is the omitted category. Education level is measured with two indicator variables for whether the household head has a high school education or greater than a high school education, where less than a high school education is the omitted category. A binary indicator variable is included to measure whether the household head is female. Region of residence is measured with indicator variables for East, Central, and West, where South is the omitted category.

Several variables are included to describe the household composition including household size, whether there are two adults in the household,[31] and the ages of any children in the household. Children are measured using indicator variables for whether the children are ages 0 to 2 or ages 3 to 5, with ages 6 to 17 being the omitted category.

Other Measures. 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. Since over 98 percent of EITC claimants receive their benefits in a lump sum,[32] it is plausible that any effect on food stamp participation is greater in the months around when the lump sum is received. To test this, we interact a variable for each of the three trimesters of the year with the three indicators measuring actual EITC claimed.

To isolate the impact, if any, of state government, we include indicator variables for whether a state has a governor who is a Democrat or an Independent, with Republican being the omitted category.

V. Findings

Our empirical results indicate there are many significant determinants of FSP program participation. First, we present the results of the descriptive analyses identifying patterns of

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[30] The employment growth rate for year t is defined as $t = Log(EMP_t)-Log(EMP_t-1)$, where $Log(EMP_t)$ = Log(state employment/state total population).

[31] We used an indicator for whether there are two adults in the household instead of marital status because it more accurately captures the existence of two potential wage earners in the household.

federal EITC receipt, food stamp receipt, and joint EITC-food stamp receipt among several subgroups of interest. Second, we present the results of the multivariate analyses for models 1, 2, and 3 examining factors that affect FSP participation, holding other variables constant. The results from all three models are statistically significant, however, the results vary making it difficult to determine the degree to which federal EITC receipt is related to FSP participation and how the two income support programs interact.

Patterns of Joint EITC and Food Stamp Receipt Over Time

The food stamp participation measures capture each month's activity as well as months of participation during each year. We present the SIPP data as reported and/or imputed by the Bureau of the Census, despite the apparent underreporting of food stamp benefits and the EITC.

The panel nature of the data allows a long-term picture of participation. For the descriptive analyses, we define food stamps eligibility as having an income under 130 percent of the poverty line and having low enough assets to qualify for food stamps in at least some of the relevant period. Of household heads ever eligible on this basis during the 1996-1999 period, only about 22 percent reported ever participating. Even among those with 12 months or more of food stamp eligibility based on this income threshold, only about half obtained at least one month of food stamps over the period. However, the households that ever obtained food stamps did so for a long period. The sample of those ever eligible divides into two groups:

1. Those who never participated in the program; this group makes up about 78 percent of eligibles, despite averaging over seven months of income eligibility; and

2. Those who participated in the program at least one month; this group had 17.6 months of participation out of 22 months of eligibility.

Table 1 presents data showing the 1996-99 decline in the proportion of food stamp eligibles participating in the program by subgroup. In a typical month, participation rates were substantially higher for households with unmarried heads, for those not employed, and for those employed. Among employed, but unmarried, less than half of the eligibles obtained food stamps in a typical month.

Receipt of EITC, as reported to SIPP interviewers, fell far below participation in food stamps, even among families with children that had low incomes at some point over the 1996-1999

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[32] 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.

period. However, as Table 2 shows, 50-60 percent of these respondents did not provide any answer to the relevant questions about their taxes. Of families with children eligible for food stamps in the relevant year, only 14-18 percent stated they received an EITC benefit in 1997-1999 (based on their prior year's income). At the same time, food stamp eligibles reporting EITC receipt made up 41-44 percent of those who responded "yes" or "no" to the EITC receipt question. These figures are quite low in comparison to the estimates of over 80 percent EITC participation rates derived from an Internal Revenue Service study that matched tax records with records from the national sample interview in the Current Population Survey.[33]

Perhaps not surprisingly, reported take-up of EITC was considerably higher among those who participated in food stamps. As Table 2 shows, 71-78 percent of those who obtained food stamps in a given year *and* responded to the EITC question stated that they claimed the EITC. These figures were nearly double the participation reported by food stamp eligibles who did not participate in food stamps in the current year. The problem with these reported EITC claims is the large share of respondents who simply did not answer questions about their taxes. Of the food stamp participants asked the question about whether they received EITC, only 21-31 percent responded "yes" and about nine percent responded "no."

One alternative to using self-reported claims about EITC involves simulated EITC eligibility based on earnings, other income, number of children, and the EITC rules. Unfortunately, while we can simulate eligibility, we cannot easily capture individual use of EITC. A common assumption is that all or nearly all heads of families with children who are eligible for EITC actually file a tax return and obtain the credits. Using this upper bound estimate, we can see a substantial overlap between food stamp participation and EITC. Of those receiving food stamps in 1997, about half were eligible for EITC on the basis of 1997 earnings and other income. The figure was virtually identical for the other years.

What about those eligible for food stamps, especially those who did not claim benefits? Household heads that reported receiving EITC represented 15-19 percent of food stamp eligibles but about 50 percent of food stamp eligibles that responded "yes" or "no" to the tax question. The overlap was larger between those who were eligible but not receiving food stamps and EITC receipt. About 14-18 percent of eligible, nonparticipants said they received EITC, but this group constituted 41-44 percent of those responding to the EITC question.

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[33] Internal Revenue Service. 2002. *Participation in the Earned Income Tax Credit Program for Tax Year 1996*. Fiscal Year 2001 Research Project #12.26. Prepared by SB/SE Research.

Given the substantial underreporting, it is instructive to ask about the overlap between food stamp eligibility and EITC eligibility. We know that the eligibility overlap overstates the overlap in participation because of food stamp participation rates are well below 100 percent. But, this dual eligibility describes what existing law intends in structuring government help to low-income working families. These figures reveal a substantial overlap.

In 1997, for example, nearly 73 percent of food stamp eligible households with children qualified for EITC and 72 percent of EITC eligibles qualified for food stamps. The percentage of EITC eligibles qualifying for food stamps remained constant at about 70 percent in 1998 and 1999. At the same time, the rate at which food stamp recipients were eligible for EITC fell markedly to about 45-47 percent. As employment among low-income household heads increased between 1997 and 1999, it is plausible that the eligibility overlap would have increased as a greater number of low-income households have earnings (thus making them eligible for EITC in addition to food stamps). The observed decrease in eligibility overlap between 1997 and 1999 is somewhat surprising.

The Relationship Between Federal EITC Benefits and Food Stamp Program Participation Considering State EIC Programs

In this section we present the results of logit models 1 and 2. We begin by briefly discussing the overall results for each model and include a discussion of some caveats associated with our findings for each model. We then discuss our results in more detail emphasizing the full form results for the independent variables for both models 1 and 2.[34]

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[34] The directional effect (e.g., positive or negative) of an independent variable in the logit models can be determined from the sign of its coefficient. However, the coefficient does not clearly indicate the marginal effect of that variable on the probability of food stamp participation. We determine the marginal effects as follows. The coefficient values represent the effect of a change in an independent variable on F^{-1} (probability of food stamp participation) where $F^{-1}(\bullet)$ is the inverse function of the logistic cumulative density function. Consequently, the interpretation of logit estimates is not intuitive. To get the increase in the probability of food stamp participation given a one-unit increase in an independent variable, one must instead look at converted estimates. We convert the estimates to determine the marginal effects as follows.

For indicator (0-1) independent variables, we calculate (1) the predicted probability of food stamp participation when the indicator variable is set to one and all other characteristics are set to the mean for the population, and (2) the predicted probability of food stamp participation when the indicator variable set to zero and all other characteristics set to the mean for the population. The marginal effect is the difference between the predicted probability in (1) and the predicted probability in (2). For continuous variables in the logit models, the procedure is similar, except that we determine the change in predicted probabilities from a one-unit change in the given independent variable from its mean value when all other

Model 1 Results. The results of the reduced and full forms of logit model 1 indicate that the federal EITC claimed is positively and significantly related to FSP participation (Table 3). For the full form model, we find that the coefficient for the low ($1-$999) amount of actual EITC claimed is significantly different from the coefficients on the medium ($1,000-$1,999) and high ($2,000+) amounts at the ten percent level. For the reduced form model, we find that the coefficient for the low ($1-$999) amount of actual EITC claimed is significantly different from the high coefficient, however, the low and medium and high and medium coefficients are not significantly different from one another.

On the other hand, model 1 yields a negative and statistically significant impact of refundable state EIC programs on FSP participation. There is a small difference in magnitude between the reduced form and full form results for the refundable state EIC variable in model 1.

As discussed earlier, the vast majority of EITC recipients receive the benefit in a lump sum payment between January and April. Therefore, we might expect that the decision to participate in the Food Stamp Program would be affected by the seasonal nature of EITC benefits. To determine whether the *timing* of the actual EITC benefits claimed affects the relationship between the EITC claimed and FSP benefits, we interacted a calendar trimester variable (i.e., January-April, May-August, and September-December) with low, medium, and high amounts of EITC benefits claimed. As Table 4 shows, there is not a significant difference between the coefficients of the actual EITC variable interacted with the calendar trimester.[35] That is, we find no evidence of a seasonal effect of actual EITC on FSP participation.

Thus, the coefficients on the federal EITC variables suggest that households that claim EITC are more likely to participate in food stamps, though there does not appear to be a strong relationship between the amount of EITC claimed and food stamp participation. On the other hand, the coefficient on the refundable state EIC variable suggests that greater earned income credits reduce a household's likelihood of participating in the FSP. Because, as discussed earlier, there is much missing data for EITC claimed in the SIPP, we are very skeptical of the results for the effect of the federal EITC. Furthermore, because federal EITC is determined by a household's number of children and income, it is possible that the coefficients on the EITC variables simply reflect a more complicated relationship between income, number of children, and food stamp participation than our control variables capture on their own. So, while the results of model 1 do

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independent variables are set to their mean values. The converted values are then the increase in probability of food stamp participation due to an independent variable.

[35] The results for the explanatory variables other than actual EITC claimed interacted with the trimester indicator variables are very similar to results reported in Table 3 and, therefore, are not repeated in Table 4.

suggest that households that claim EITC may be more likely to participate in food stamps, they certainly do not prove that this relationship exists. Moreover, there is nothing in the model 1 results that suggests that increasing the generosity of the EITC increases food stamp participation.

Model 2 Results. In sharp contrast to the model 1 results, model 2 estimates based on computed EITC benefits show a negative and statistically significant effect of EITC on FSP participation. However, the magnitude of the EITC effects declines as the amount of computed federal EITC benefits increases (Table 5). The results of the full form model 2 indicate that the effect of computed federal EITC is negative and significant for medium and low amounts of EITC ($1-$999 and $1,000-$1,999) and negative but not significant for high amounts of EITC ($2,000+). Again, we find that the coefficients for the low ($1-$999) and medium ($1,000-$1,999) amount of computed EITC are not significantly different from one another, however, the coefficients on the low and medium amounts are each significantly different at the ten percent level from the coefficient on the high amount ($2,000+).

Also in contract with model 1, the full and reduced forms of model 2 indicate that refundable state EIC programs do not have a statistically significant impact on FSP participation.

Table 6 shows the results for model 2 (for the full form only) measuring the seasonality of EITC benefits a household would be eligible to receive confirm the overall results above for seasonal model 1.[36] We find that the trimester coefficients are not significantly different from one another in model 2. That is, model 2 provides no evidence of a seasonal effect of computed EITC on FSP participation.

We turn now to a discussion of findings for particular explanatory variables for both models 1 and 2.

Federal EITC Measures. As discussed above, the results of the full form model 1 indicate that actual federal EITC claimed is positively and significantly related to FSP participation (Table 3). Specifically, the likelihood that a household head participates in the FSP increases by 2.4 percentage points if the household claims EITC of under $1,000 (as compared to households claiming no EITC benefits). For households claiming a medium and high federal EITC the increase is 4.2 and 5.5 percentage points, respectively.

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[36] The results for the explanatory variables other than EITC a household is eligible for interacted with the trimester indicator variables are very similar to results reported in Table 5 and, therefore, are not repeated in Table 6.

The results of the full form model 2 find that computed federal EITC is negative and significant for low ($1-$999) and medium ($1,000-$1,999) levels of EITC, however, high ($2,000) is not significantly different from those households who are not eligible for EITC. Specifically, the likelihood that a household head participates in the FSP decreases by 2.2 and 2.4 percentage points if the household head is eligible for $1-$999 and $1,000-$1,999 of EITC income, respectively.

The results in model 2 indicate a very different effect of EITC on FSP participation than model 1. This may be because (1) the actual federal EITC benefits a household claims is, at least in part, affected by unobserved factors that also affect FSP participation (such as knowledge of federal programs), making the coefficient on actual EITC benefits in model 1 biased due to omitted variable bias; or (2) actual EITC claimed is inaccurate as measured in the SIPP, and EITC benefits a household is eligible for is more accurately measuring the relationship between EITC and FSP participation. With respect to explanation (1), as discussed above, we tested whether actual EITC claimed is endogenous. While we could not reject the null hypothesis of exogeneity at the five percent level, but we could reject it at the ten percent level, suggesting that our EITC variable in model 1 might be endogenous.

State EIC Measures. The results estimating the impact of refundable state EIC programs differ for models 1 and 2 (Tables 3 and 5). In model 1, the refundable state EIC variable is significant and negatively related to FSP participation. On average, a household in a state with a refundable EIC program is 1.5 percentage points less likely to participate in food stamps (Table 3). In model 2, on the other hand, the refundable state EIC is not a significant predictor of FSP participation (Table 5).

Food Stamp Program Variables. Models 1 and 2 indicate that the implementation of Electronic Benefits Transfer (EBT) systems in states does not have a significant impact on FSP participation in the reduced form or the full results.

Welfare Program Variables. We include four welfare program variables in models 1 and 2—two are measures of welfare program participation: (1) an indicator measuring TANF participation, and (2) the amount of TANF benefits received; and two are measures of welfare implementation: (1) presence of a state waiver program, and (2) TANF implementation statewide.

The welfare program participation measures are omitted from the reduced form models 1 and 2 due to endogeneity concerns. In the full form models 1 and 2, TANF participation has a positive and significant impact on food stamp participation. An average household participating in TANF is 32.0 percentage points more likely to participate in food stamps according to model 1

(Table 3) and 44.5 percentage points more likely to participate in food stamps according to results from model 2 (Table 5). In addition, for an average household, receiving an additional $100 in TANF benefits results in a 0.8 percentage point increase in food stamp participation for model 2, while TANF benefits received was not significant in the full form model 1.

Of our two measures of welfare implementation—presence of a state waiver program and TANF implementation statewide—only the former is significant and negative in both reduced and full form model 2, while neither are significant in reduced and full form model 1. A state waiver program has a negative impact (-0.8% or –2.1%, reduced and full form, respectively) on food stamp program participation in model 2. The magnitude and negative findings are consistent with findings from other studies measuring implementation using waiver dummy variables (Wilde et al. 2000; Wallace and Blank 1999). Studies that use PRWORA or state welfare rules tend to find greater negative impacts (Currie and Grogger 2001; Gleason et al. 2001).

Macroeconomic Conditions. Our results for full and reduced form model 1 indicate that the monthly state unemployment rate does not have a significant impact of FSP participation. The annual state employment growth rate, on the other hand, is negative and significant in full form model 1.

Our results for reduced form model 2 indicate that the monthly state unemployment rate has a significant and positive impact on FSP participation while the annual state employment growth rate does not have an impact. The significance of the monthly state unemployment rate is explained away in full form model 2 when individual-level employment status variables are introduced into the model. While other studies find strong relationships between the unemployment rate and declines in food stamp participation, this relationship is quite likely due to the correlation between the unemployment rate and the employment status of individuals eligible for food stamps.[37] Since our regressions control for individual employment status, this correlation will not affect the coefficients on the macroeconomic variables.

Employment Status. As discussed above, due to concerns about endogeneity, we omit the employment status of the household head and spouse from our reduced form models 1 and 2. As full form models 1 and 2 show, employment by the household head and spouse (compared to unemployment) are both significant and negatively impact food stamp participation (Tables 3 and 5) for the average household. Employment by the household head makes participation in the FSP 1.1 percentage points less likely than for an average household where the head of the

[37] This result may also be due to the limited variation in the unemployment rate over the time period and the noise due to our use of monthly data.

household is out of the labor force (Table 3). Results for model 2 confirm these results with an employed household head being 3.6 percentage points less likely to participate in food stamps than a household head that is out of the labor force (Table 5). Spousal employment reduces participation in the FSP by 1.9 and 3.6 percentage points in models 1 and 2, respectively.

Likewise, heads of household that are in the labor force but not employed are also less likely to participate in food stamps (-1.4 percentage points for model 2) than a household where the head is out of the labor force. Having a spouse in the labor force but unemployed is not a significant predictor of food stamp participation.

Income and Assets Measures. Not surprisingly, a household's total income and assets negatively impact Food Stamp Program participation. We find that an additional $1,000 in total household income makes an average household 5.2 percentage points less likely to participate in food stamps as indicated by full form model 2. Likewise, an additional $1,000 in household assets also reduces participation in the FSP, by 4.7 percentage points according to full form model 2. The effect of household income-squared is positive, however, the overall effect of household income is negative for households within our sample since the breakeven point is well above the income levels in our sample.

Demographic Characteristics. Our results for full form models 1 and 2 indicate that several demographic characteristics are significant negative predictors of food stamp participation (Tables 3 and 5). Household heads that have a greater than high school education are significantly less likely to participate in food stamps than household heads with less than a high school education in model 2 (the relationship is negative but not significant in model 1). Not surprisingly, an average two-adult household is less likely to participate in food stamps compared to a single-adult household according to models 1 and 2.

Our results for models 1 and 2 also indicate that several demographic characteristics are significant positive predictors of food stamp participation (Tables 3 and 5). Households with young children ages 3-5 are more likely to participate in food stamps than households with children ages 6-17. Non-Hispanic African American household heads are somewhat more likely to participate in the FSP (0.9 and 1.5 percentage points more likely according to full form models 1 and 2, respectively) than non-Hispanic white households. On average, households with a female head are also more likely to participate in food stamps. Finally, not surprisingly, larger households are more likely to participate in food stamps; each additional household member increases the likelihood of participating in food stamps by 1.2 and 0.9 percentage points according to full form models 1 and 2, respectively.

Difference-in-Difference Approach to Examining the Relationship Between the EITC and Food Stamp Participation

This section checks for potential EITC impacts using an alternative approach. As noted above, though the added income from EITC does not reduce food stamp eligibility, EITC payments could nevertheless lower food stamp participation by helping families afford food without obtaining food stamps. Another possibility is that families gaining income from EITC become less willing to bear the transaction costs associated with applying for food stamps. Finding such effects is complicated by the fact that EITC increases go together with increased earnings. Thus, over an earnings gain in which EITC is increasing, food stamp participation might decline because of added earnings or because of added EITC payments. This model attempts to distinguish between these two effects by comparing situations in which the same increases in earnings lead to or do not lead to an increase in EITC.

Such situations arise because families moving through the same segments of earnings will see increases or no increase in EITC depending on whether they have one child or two or more children. We can take advantage of this program feature by using a difference-in-difference methodology. This approach allows for the possibility that the level of food stamp participation rates may differ between families with one child and families with two or more children for reasons than EITC. The focus is on how differences in the way EITC *changes* for families with the same change in earnings affect *changes* in participation rates. For example, in 1999, families within the $6,801-9,540 range of earnings saw either no change in their EITC payment with an increase in earnings (a one-child household) or a rise in EITC of 40% of each increase in earnings (a household with two or more children). If higher EITC levels reduced food stamp participation rates independently of gains in earnings, the decline in participation rates should be more rapid in this range for families with two or more children than for families with one child as their earnings increased in this range.

Table 7 provides some suggestive evidence of this differential change in participation rates. Although the earnings ranges vary by year in line with EITC program rules, the earnings segments are:

- Zero earnings;
- EITC increases with earnings for both groups of families;
- EITC increases with earnings for 2+ children families and remains flat for one-child families;
- EITC remains flat with earnings for both groups of families; and

- EITC declines for both groups of families.

The focus is on the earnings range where a change in earnings raises EITC for 2+ children families and leaves EITC constant for one-child families. As the Table 7 reveals in the third row of each panel, food stamp participation rates in all four years decline more rapidly over this range for 2+ children families than for one-child families. For example, in 1998, the participation rate was virtually unchanged for one-child families (up +1.2 percentage point), but declined by 12.4 percentage points for 2+ children families. Thus, as the italicized row shows, the difference in the reduction in food stamp participation was –13.6 percentage points; that is, food stamp participation rates declined nearly 13.6 percentage points more for 2+child families than for one-child families. Although this tendency for faster reductions for families subject to EITC increases than for families subject to flat EITC payments prevailed in all years, the difference-in-differences across years ranged widely from -3 to -24 percentage points. This suggests that the relationship is not particularly stable. Still, the direction of the changes were all consistent with a negative EITC effect on food stamp participation rates.

Another way to compare differential responsiveness to earnings is to divide changes in participation rates by changes in earnings. The bottom panel of Table 7 displays percentage point changes in food stamp participation per $1,000 increase in earnings across EITC-related earnings categories. Again, as the third row of the panel shows, the declines in food stamp participation are higher among families with 2+ children than among families with one child. Thus, the higher reductions for 2+ children families were not the result of higher earnings gains.

One can compare these difference-in-differences to a set of difference-in-differences in the subsequent earnings ranges. Earnings over flat ranges for both 2+ children families and one-child families do not involve increases in EITC for either household type. If the decline in participation among 2+ children families continued to exceed those for one-child families over this range, we might conclude that 2+ children families always respond more to earnings reductions than do one-child families. Such a result would cast doubt on the main difference-in-difference findings reported in Table 7. In fact, we find no tendency for a sharper reduction among 2+ children families in the flat range of EITC for both household types. On the row labeled, *EITC flat for one-child & 2+ children*, the reductions are typically larger among one-child families. Only in 1997 did participation rates decline faster in this segment for 2+ children families than for one-child families.

Table 7 provides other interesting results. Note that food stamp participation rates decline even when families have only a very modest amount of earnings. For example, while the row after zero represents an earnings level of only about $3,300-$3,800, the results show declines in food

stamp participation rates of about ten percentage points. Further declines in food stamp participation rates take place as earnings reach about $6,300-$6,800. By the time earnings rises to the flat EITC portion for one-child families, their participation rates have declined by 18-24 percentage points.

For an alternative approach to examining differences in the way one-child and 2+ children respond to earnings changes over various EITC ranges, we turn to the spline regressions. These regressions, reported in Table 8, yield estimates of the change in months of food stamp participation per $1,000 change in earnings within each EITC-related earnings category, controlling for months of food stamp eligibility, race, and education of the head of the household. The estimates cover 1997, 1998, and 1999 and relate only to those with at least some earnings. The dependent variable is months of food stamp participation in a calendar year in response to changes in earnings within categories in the prior year, since prior year earnings determine current year receipt of EITC.

The results provide evidence of a negative EITC effect in only one of the three years. In the 1998 regression, the spline coefficients for the key earnings category (EITC is flat for one-child household, increases for families with two or more children) operate in line with a negative EITC effect on months of food stamp participation (holding months of food stamp eligibility constant). Note in Table 8 that an added $1,000 of earnings within this category lowers food stamp participation by about 0.6 months for families with 2+ children; oddly, added earnings in this range appear to raise months of participation for families with one-child. In sharp contrast with these results, no similar pattern of differences in earnings coefficients appear in the 1997 and 1999 regressions. Thus, the results from the spline regressions offer no robust evidence of an EITC effect on food stamp participation rates.

VI. Conclusions

This study is the first to focus on examining the relationship between the EITC and FSP participation. It expands upon prior studies aimed at explaining declining food stamp participation rates in three important ways. First, we include measures estimating the impact of federal EITC benefits and the presence of refundable state EICs. Second, in addition to program implementation measures (e.g., presence of a state waiver program, TANF implementation, etc.) and macroeconomy measures (e.g., unemployment rate, employment growth rate), we include *individual-level* program participation information (e.g., amount of TANF benefits received, employment status, etc.). Third, we present difference-in-difference estimates resulting from the differential EITC formulas affecting families with one child and with 2+ children. In most cases, our findings are consistent with previous studies measuring factors associated with reductions in