LABOR SUPPLY RESPONSE TO THE EARNED INCOME TAX CREDIT*

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This paper examines the impact of the Tax Reform Act of 1986 (TRA86), which included an expansion of the earned income tax credit, on the labor force participation and hours of work of single women with children. We identify the impact of TRA86 by comparing the change in labor supply of single women with children to the change for single women without children. We find that between 1984–1986 and 1988–1990, single women with children increased their relative labor force participation by up to 2.8 percentage points. We observe no change in the relative hours worked by single women with children who were already in the labor force.

Historically, the United States has chosen to provide a safety net for families with children. Since 1935, Aid to Families with Dependent Children (AFDC) has supplied cash welfare payments to needy single-parent families. Families on AFDC may also receive food stamps, medicaid, and housing assistance. Because the maximum level of benefits is received by families with no income and because benefits are reduced almost dollar for dollar with additional earnings,[1] the welfare system is predicted by static labor supply theory to discourage the labor force participation and hours of work of single parents. Existing empirical evidence mostly confirms these theoretical predictions.[2]

In a series of major expansions beginning in 1987, the earned income tax credit (EITC) has emerged as a popular alternative method for transferring income to needy families with children. The EITC is a refundable credit; therefore, any credit due in excess of tax liability is refunded to the taxpayer in the form of a tax refund check. In 1996 when the most recent expansion of the EITC is scheduled to be fully phased in, the maximum credit will reach $2206 for a taxpayer with one child and $3644 for a tax-

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1. For discussions of effective marginal tax rates from the welfare and tax systems see Fraker, Moffitt, and Wolf [1985], Dickert, Houser, and Scholz [1994], and Giannarelli and Steuerle [1994].
2. Moffitt [1992] and Danziger, Haveman, and Plotnick [1981] survey the empirical literature.

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payer with two or more children. Advocates of the EITC argue that the credit transfers income to a particularly deserving group of people, the working poor, and that the redistribution occurs with much less distortion of labor supply than is caused by other elements of the welfare system. In particular, the credit is said to encourage labor force participation.

The EITC creates a complicated and ambiguous set of labor supply incentives. Standard labor supply theory does indeed predict that the EITC will encourage labor force participation. This occurs because the EITC is available only to taxpayers with earned income. But theory also predicts that the credit reduces the number of hours worked by most eligible taxpayers already in the labor force. While the credit initially increases with income, producing offsetting income and substitution effects on hours worked, over 70 percent of recipients have incomes in regions in which the credit is constant (and therefore produces only a negative income effect on labor supply) or is being phased out (producing negative income and substitution effects). Moreover, since the phaseout of the credit produces a nonconvexity in the budget constraint, taxpayers with incomes beyond the phaseout region may choose to reduce their hours of work and take advantage of the credit. Cumulative marginal tax rates can be quite high in the phaseout region. In 1996 some taxpayers with two children and income between \$11,610 to \$28,495 will face a net marginal tax rate (on the worker's marginal revenue product) of 53 percent.[3]

In this paper we examine the impact of the Tax Reform Act of 1986 (TRA86), which included an expansion of the EITC, on labor force participation and hours of work. The expansion of the credit affects an easily identifiable group, single women with children, but is predicted to have no effect on another group, single women without children. Other features of TRA86, such as the increase in the value of dependent exemptions and the large increase in the standard deduction for head of household filers, are predicted by economic theory to have reinforced the impact of the

3. We assume that the full incidence of payroll taxes falls on the worker. The net marginal tax rate is the share of the worker's marginal revenue product that is paid in taxes and lost benefits. A worker whose gross pay is \$10 an hour would have a marginal revenue product of \$10.765, since the employer pays half of the OASDHI payroll tax. After subtracting \$1.50 for federal income tax, \$.60 for state income tax, \$.765 for the employee's share of OASDHI, and \$2.106 in lost EITC payments, the taxpayer has a net of tax and benefits hourly wage of \$5.029. Dividing the total tax and lost benefits \$5.736 by \$10.765 yields a marginal tax rate of 53.3 percent. If some of employee compensation is in untaxed benefits, then this is an overstatement of marginal tax rates.

EITC on the *relative* labor supply outcomes of single women with and without children. We therefore compare the change in labor supply of single women with children to the change in labor supply of single women without children. We find that after TRA86, the labor force participation of single women with children increased by up to 2.8 percentage points relative to single women without children (from a base of 73.0 percent). We explore a number of alternative explanations for this finding, and conclude that the expansion of the EITC and the other provisions of TRA86 are the most likely explanation. We find no effect of the EITC expansion on the hours of work of single women with children who were already in the labor force.[4]

The remainder of the paper is divided into six sections. Section I explains the eligibility rules and structure of the EITC and outlines the predicted impact of the EITC on participation and hours of work. Section II discusses our identification strategy and our various treatment and control groups. Section III describes the data. Section IV presents empirical results for labor force participation. Section V presents estimates for hours and total employment. Section VI concludes.

I. The Structure of the EITC

The earned income tax credit began in 1975 as a modest program aimed at offsetting the social security payroll tax for low-income families with children. After major expansions in the tax acts of 1986, 1990, and 1993, the EITC has become a central part of the federal government's antipoverty strategy. By 1996 federal spending on the EITC (including both tax expenditures and outlays) is projected to be 1.7 times as large as federal spending on AFDC.

A taxpayer currently needs to meet three requirements in order to be eligible for the earned income tax credit. First, the

4. A number of other papers have analyzed labor supply response to the EITC. We believe, however, that our paper is the first that estimates actual behavioral responses to a change in the credit. Three papers have used estimates from the negative income tax experiments to predict the impact of the EITC on labor supply [Hoffman and Seidman 1990; GAO 1993; Holtzblatt, McCubbin, and Gillette 1994]. In addition, Dickert, Houser, and Scholz [1995] estimate a joint labor market and welfare participation model that incorporates the EITC. Using their results and hours of work elasticities from the labor supply literature, they simulate the effects on labor supply of the recent expansion of the EITC. Finally, Triest [1993] and Browning [1995] present opposing views on whether the EITC is an efficient method of transferring income to low-income families.

taxpayer must have positive earned income. Earned income is the sum of wage and salary income, business self-employment income, and farm self-employment income. Second, a taxpayer's adjusted gross income and earned income must both be below a specified amount (In 1996 the maximum income for a taxpayer with two or more children to be eligible to receive the EITC is $28,495). Third, a taxpayer must have a qualifying child.[5] A qualifying child is a child, grandchild, stepchild, or foster child of the taxpayer who is under the age of 19 (under 24 if a full-time student) or permanently disabled, and who lives with the taxpayer for more than one-half of the tax year. Until 1991 the rules for EITC eligibility were more complicated and depended on the taxpayer's filing status.[6] The credit is refundable so that a taxpayer with no federal tax liability, for example, would receive a tax refund from the government for the full amount of the credit. Taxpayers may also receive the credit throughout the year with their paychecks; but in 1992, the most recent year for which data are available, less than one-half of 1 percent of all EITC recipients availed themselves of this early payment option [Internal Revenue Service 1992].

The amount of the credit to which a taxpayer is entitled depends on the taxpayer's earned income, adjusted gross income, and, since 1991, the number of EITC-eligible children in the household. In 1996 the credit for a family with two or more children is phased in at a 40 percent rate over the first $8890 of earned income, resulting in a maximum credit of $3556. As income rises from $8890 to $11,610, the credit remains at $3556. Then the credit is phased out at a 21.06 percent rate on income starting from $11,610 (the maximum of AGI and earned income governs the phaseout), so that by $28,495 the taxpayer is no longer eligible for the credit.

Figure I shows how the introduction of an EITC shifts the

5. Beginning in 1994, a small credit is available to low-income workers without children.

6. Before 1991 a taxpayer could claim the EITC only if he or she used a filing status of married filing jointly, head of household, or surviving spouse. A married taxpayer could claim the EITC only if he or she claimed a dependent child on his or her tax return, and the child lived with the taxpayer for more than six months during the year. An unmarried taxpayer filing as head of household did not have to claim the child as a dependent in order to be eligible for the EITC, but, in order to file as head of household, the taxpayer must have paid more than half the cost of keeping up the home. Therefore, both married filers (through the rules for claiming a dependent) and head of household filers were required to meet a support test. AFDC payments are not considered support provided by the taxpayer. Consequently, a taxpayer with $6000 in AFDC income and $5000 in earned income was not eligible for the EITC under pre-1991 rules.

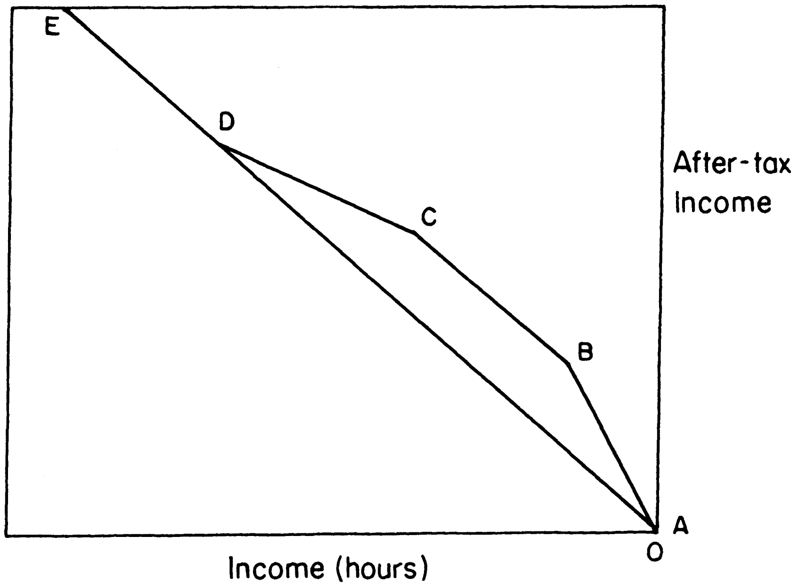

FIGURE I
EITC Budget Constraint

budget constraint of an otherwise untaxed individual from *ADE* to *ABCDE*. Under the new budget constraint every choice of hours (or equivalently pretax earnings) produces at least as much after-tax earnings (and utility) as it did before the earned income tax credit was introduced. The well-being of a taxpayer who does not work has not changed because no earned income tax credit is available to a taxpayer with zero earnings. Thus, any taxpayer who preferred working before will still prefer working, and some taxpayers may find that the additional after-tax income from the EITC makes it worth entering the labor force. The impact of the EITC on the labor force participation of unmarried taxpayers is therefore unambiguously positive.

The impact of introducing an EITC on the hours of work of a taxpayer already participating depends on which region of the EITC the taxpayer was in before the credit was introduced. For a worker in the phase-in, the effect on labor supply is theoretically ambiguous: the credit subsidizes the worker's wage so that the substitution effect encourages additional hours while the income effect causes hours to decrease. For a worker in the constant region, there is only an income effect, reducing hours. In the phaseout region the EITC unambiguously reduces labor supply since there is both a negative substitution effect from the credit being phased out and a negative income effect from the additional income the credit provides to the taxpayer. Beyond the credit region, taxpayers may decide to reduce their hours of work and receive the credit.

II. Identification Strategy

We study the labor supply response of single women with children to the 1987 expansion of the earned income tax credit, which occurred as part of the Tax Reform Act of 1986. We focus on single women with children because they are the largest group of taxpayers eligible for the EITC, making up approximately 48 percent of the EITC eligible population in the March 1992 CPS [Eissa and Liebman 1993]. In addition, they are the group most relevant for studying whether the EITC reduces welfare dependency. Finally, they are the group for which we can most plausibly ignore the joint labor supply decisions of other family members, and thus derive simple predictions from labor supply theory.[7] We study the 1987 expansion of the credit because it was the largest EITC expansion that was not phased in over a number of years. The incentives created by the 1987 expansion of the EITC were reinforced by other tax changes implemented after the Tax Reform Act of 1986, making the relative impact on single women with children similar in size to the larger EITC expansions of the 1990s.

The 1987 expansion of the EITC increased the subsidy rate for the phase-in of the credit from 11 percent to 14 percent and increased the maximum income to which the subsidy rate was applied from \$5000 to \$6080. This resulted in an increase in the maximum credit from \$550 to \$851 (\$788 in 1986 dollars). The phaseout rate was reduced from 12.22 percent to 10 percent.

7. In a two-parent family the credit may reduce the probability of participation for the secondary earner through an income effect. The overall effect on family labor supply will depend critically on the model of labor supply assumed to hold at the household level and on the distribution of earnings within the family. In 47 percent of married couples earning less than \$25,000, the woman accounts for at least 40 percent of the family's earnings (March 1993 CPS). Therefore, the common assumption that a family's marginal tax rate is determined by the male's earnings may not be appropriate for this population. Even for household heads, the simple model may not be sufficient. Edin and Jencks [1993] show that most single mothers receiving AFDC also receive income from boyfriends and extended family members, and often have unreported labor income.

The higher maximum credit and the lower phaseout rate combined to expand the phaseout region. Taxpayers with incomes between \$11,000 and \$15,432 became eligible for the credit and faced its phaseout marginal tax rate for the first time in 1987. The constant region was lengthened in 1988, further extending the phaseout region to \$18,576. At every level of earnings the EITC amount after the expansion was at least as large as it was before. Therefore, theory predicts that labor force participation of eligible taxpayers will increase in response to the expansion.

The positive impact of the EITC expansion on the average return to work was reinforced by other elements of the Tax Reform Act of 1986. TRA86 increased the standard deduction for a taxpayer filing as head of household from \$2480 in 1986 to \$4400 in 1988 (the standard deduction for single taxpayers rose from \$2480 to \$3000). TRA86 further reduced the tax liability of taxpayers with children by increasing the deduction per dependent exemption from \$1086 in 1986 to \$1950 in 1988. Finally, the tax schedules were changed. The tax schedule changes were particularly beneficial to head of household filers because the increased standard deduction and exemption amounts meant that in 1988 the typical head of household filer did not jump from the 15 percent tax bracket to the 28 percent tax bracket until her AGI exceeded \$33,565. In contrast, a single filer would begin paying 28 percent on AGI over \$22,800.

In contrast to the positive predicted impact of the EITC expansion on the labor force participation of single workers with children, the expansion should have decreased hours of work for most eligible taxpayers who were already in the workforce. A more detailed discussion of the impact of the 1987 expansion on hours of work is deferred until Section V.

Our estimation strategy compares the labor force participation and hours worked of single women with children before and after TRA86. Most single women with children are eligible for the EITC (if they have appropriate incomes), and if they file tax returns, they usually file as household heads. While the difference between the 1988 and 1986 tax liability of a taxpayer varies by income, we cannot use this variation as the basis of our work because the amount of tax paid by a taxpayer and her labor supply are endogenously determined. Thus, the "treatment" in this natural experiment is not a specific change in tax liability. Rather, it is the entire shift in the budget constraint. In practice, therefore, we rely on time to identify the responsiveness of female household heads to the EITC and the other aspects of TRA86. Since there may be underlying trends in participation or hours of work and there may be other policy or economic shocks that affect labor market outcomes, we use control groups to allow us to isolate the impact of TRA86 from other factors. A good control group is similar in its characteristics to the treatment group—and therefore likely to respond similarly to the underlying trends or contemporaneous shocks—but does not receive the treatment.

As we explained earlier, eligibility for the EITC depends on the presence of a child in the tax unit and on income being above zero and below the level at which the credit is completely phased out. The expansion of the EITC may, however, affect taxpayers with incomes beyond the level at which the credit is completely phased out since they might reduce their hours (and incomes) and take advantage of the increased credit. Therefore, we use all single women with children as our primary treatment group.[8] We use all single women without children as the control group. The difference between the change in labor force participation of single women with children and the change of single women without children is our estimate of the effect of TRA86 on participation. This is essentially the difference-in-differences approach. It controls for any contemporaneous shocks to the labor force participation of single women with children through the change in participation for the control group. The two identifying assumptions that we make are (1) there are no contemporaneous shocks (other than the tax changes) to the relative labor market outcomes of the treatment and the control groups over the period of the reforms; and (2) there are no underlying trends in participation or hours of work that differ between the two groups.[9]

By including all single women with children in the treatment

8. We are assuming that the taxpayer's marital status and the presence of children in the tax filing unit are exogenously determined. To test whether our results are sensitive to the assumption that fertility decisions are exogenous, we reestimated our basic model using as our treatment group only women who had a qualifying child over age five. Our results did not change.

9. Contamination of the treatment and control groups (which would bias our results toward zero) should not be a large problem in this application. We have checked our allocation methodology using a CPS-IRS match described in Liebman [1995]. We find that 89 percent of women whom we allocate to the treatment group and who file a tax return claim a dependent child on that tax return (80 percent of treatment group filers, file as head of household). Ninety-five percent of women whom we allocate to the control group and who file a tax return, do not claim a dependent child on that tax return (91 percent file as single). If misallocation of individuals to the treatment group and control group happens at random, then these results imply that we should increase our labor-supply results by 19 percent.

group, we are including many taxpayers (those with high incomes) who are unlikely to be affected by the EITC. It also increases the importance of the non-EITC aspects of TRA86, since those effects were larger at incomes beyond the phaseout of the EITC. In addition, the broad treatment group makes it difficult to find good control groups. To focus on the impact of the credit on low-income families, we use two alternative treatment groups. The first is single women with children and low levels of education,[10] and the second is single women with children whom we predict (using exogenous characteristics such as age, race, state, and education) would have earned incomes making them eligible for the EITC. For each of these treatment groups, we use two control groups: single women without children and with low levels of education (predicted income in the EITC range), and single women with children and more than high school education (predicted income above the EITC maximum income). The second control group is more similar to the treatment group on one dimension—they have children—but less similar on another: they have higher education levels (predicted income beyond the EITC range).

The advantage of having multiple control groups is that if we find similar results, we can be more confident that we are estimating the actual effect of the tax reforms and not just the effect of other contemporaneous changes or trend differences between the control and treatment groups. Ultimately, then, the credibility of our results lies in the consistency of our estimates across different treatment and control groups rather than on any one estimate.

III. Data

The data we use are from the 1985 to 1987 and 1989 to 1991 March Current Population Surveys. The March CPS is an annual demographic file of approximately 57,000 households. It includes labor market and income information for the previous year, so the data we have are for tax years 1984 to 1986 and 1988 to 1990. We exclude 1987, the first year after TRA86, to allow taxpayers time to adjust their behavior.

The CPS contains information on households, families, and

10. We use two definitions of low education: less than twelve years of education and exactly twelve years of education.

individuals. However, the relevant unit of analysis for this study is the tax-filing unit. Our tax-filing units are based upon CPS families. Therefore, subfamilies (both related and unrelated) are allocated to separate tax-filing units from the primary family. We consider any member of the tax-filing unit who is under the age of 19 (or under 24 and a full-time student) to be a dependent child for tax purposes. We do not impose the support test for dependents because the test includes factors, such as AFDC income, that are endogenous to labor supply decisions. In addition, we do not have enough information to impose the EITC six-month residency test. Therefore, we assume that any taxpayer with a child under the age of 19 (or under 24 and a full-time student) meets both the dependent child and EITC child requirements.

The sample includes unmarried females (widowed, divorced, and never married) who are between 16 and 44 years old. We exclude any female who is separated from her spouse during the reference period, or who was ill or disabled, or in school full time during the previous year. We also exclude any woman with negative earned income (due to negative self-employment income), negative unearned income, or with positive earned income but zero hours of work. The resulting sample size, after pooling all six years, is 67,097 observations.

Table I presents summary statistics of the characteristics of the treatment and control groups. Column 1 presents the characteristics of all unmarried females without children (control); column 2 presents characteristics of all unmarried females with children (treatment). There are some noticeable differences between the two groups. Those who have children tend on average to be older (31.17 versus 26.78 years), less educated (12.05 versus 13.44 years of education), and less likely to have been in the workforce at any time during the previous year (.74 versus .95 probability of annual hours greater than zero). Average earnings for women with children are less than earnings for those without children. Conditional on working, however, the two groups have similar mean earnings. In columns 3, 4, and 5, we present characteristics for women with children who have completed less than twelve years of schooling, twelve years, and more than twelve years, respectively. Again there appear to be systematic differences between the attributes of the groups. The more educated the female head is, the more likely she is to be older, to have a smaller family, and to be a member of the labor force.

These summary statistics suggest that any raw differences

TABLE I
SUMMARY STATISTICS

	Group				
	Without children	With children			
			Education		
Variable		All	Less than high school	High school	Beyond high school
Age	26.78	31.17	28.67	30.88	33.97
	(7.02)	(7.07)	(7.39)	(6.79)	(6.21)
Education	13.44	12.05	9.33	12.00	14.63
	(2.33)	(2.28)	(1.81)	(0.00)	(1.54)
Nonwhite	0.15	0.37	0.43	0.37	0.33
	(0.36)	(0.48)	(0.49)	(0.48)	(0.47)
Preschool children	0.00	0.48	0.61	0.48	0.36
	(0.00)	(0.50)	(0.49)	(0.50)	(0.48)
Filing unit size	1.00	2.74	3.03	2.66	2.60
	(0.00)	(0.96)	(1.17)	(0.88)	(0.81)
Earned income	15,119	11,262	4109	10,678	18,856
	(13,799)	(12,498)	(7844)	(10,679)	(14,497)
Earnings conditional on working	15,880	15,188	8414	13,758	20,589
	(13,708)	(12,289)	(9475)	(10,225)	(13,920)
Labor force participation	0.952	0.742	0.488	0.776	0.916
	(0.214)	(0.438)	(0.500)	(0.417)	(0.278)
Weekly participation	0.789	0.603	0.326	0.635	0.803
	(0.324)	(0.437)	(0.415)	(0.426)	(0.336)
Hours of work	1531	1202	617	1260	1640
	(814)	(951)	(847)	(920)	(812)
Observations	46,287	20,810	5396	9702	5712

Data are from survey years 1985–1987 and 1989–1991 of the March Current Population Survey (CPS). The sample contains *unmarried* women between the ages of 16 and 44. We exclude women who were separated during the previous year, ill or disabled, in school. We also exclude women with negative earnings, negative unearned income, or with nonzero earnings and zero hours of work. All figures are in 1992 dollars. Preschool children is the share of the sample with preschool children. Labor force participation equals one if annual hours are positive, zero otherwise. Weekly participation equals annual weeks worked divided by 52. Standard deviations are in parentheses. Means are weighted with CPS March supplement weights.

in labor market outcomes over time between the treatment and control groups must be interpreted with caution, since the differences could reflect nontax shocks that affect people with some characteristics differently from people with other characteristics. The methods used to control for demographic differences will be critical to our analysis. These results also confirm our earlier point that there is no ideal control group. Only if results are consistent across different specifications will we have strong evidence of a tax effect.

IV. Empirical Results for Labor Force Participation

A. Basic Participation Results

Table II presents labor force participation rates for the treatment groups and control groups in the years before and after the Tax Reform Act of 1986. We define labor force participation as working a positive number of hours during the year. We use this definition of labor force participation because it is the one for which the predicted impact of the EITC is unambiguous. In each panel the first column corresponds to the average participation rate prior to TRA86; the second column to the average after TRA86; and the third column to the change in participation. The difference-in-differences estimate of the participation response is in the last column. Panel A presents the results for the first treatment group (all unmarried females with children) and control group (all unmarried females without children). The participation rate of the treatment group increased by a statistically significant 2.4 percentage points (from 72.9 percent to 75.3 percent). There was no change in labor force participation for unmarried women without children. The fact that the participation rate of the control group did not change is important, because it suggests that there is not much of an aggregate effect of which to take account. We would be concerned if there were substantial changes in the participation rate for the control group, because, in that case, our difference-in-differences estimator would depend heavily on the quality of the control group. Our first estimate of the participation response then is 2.4 percentage points, with a standard error of 0.6.

To further examine whether it was the EITC that caused the participation rate of female household heads to rise, we next focus on the subset of females with children who were most likely

TABLE II

LABOR FORCE PARTICIPATION RATES OF UNMARRIED WOMEN

	Pre-TRA86 (1)	Post-TRA86 (2)	Difference (3)	Difference-in-differences (4)
A. *Treatment group:*				
With children [20,810]	0.729 (0.004)	0.753 (0.004)	0.024 (0.006)	
Control group:				
Without children [46,287]	0.952 (0.001)	0.952 (0.001)	0.000 (0.002)	*0.024 (0.006)*
B. *Treatment group:*				
Less than high school, with children [5396]	0.479 (0.010)	0.497 (0.010)	0.018 (0.014)	
Control group 1:				
Less than high school, without children [3958]	0.784 (0.010)	0.761 (0.009)	−0.023 (0.013)	*0.041 (0.019)*
Control group 2:				
Beyond high school, with children [5712]	0.911 (0.005)	0.920 (0.005)	0.009 (0.007)	*0.009 (0.015)*
C. *Treatment group:*				
High school, with children [9702]	0.764 (0.006)	0.787 (0.006)	0.023 (0.008)	
Control group 1:				
High school, without children [16,527]	0.945 (0.002)	0.943 (0.003)	−0.002 (0.004)	*0.025 (0.009)*
Control group 2:				
Beyond high school, with children [5712]	0.911 (0.005)	0.920 (0.005)	0.009 (0.007)	*0.014 (0.011)*

Data are from the March CPS, 1985–1987 and 1989–1991. Pre-TRA86 years are 1984–1986. Post-TRA86 years are 1988–1990. Labor force participation equals one if annual hours are positive, zero otherwise. Standard errors are in parentheses. Sample sizes are in square brackets. Means are weighted with CPS March supplement weights.

to be affected by an increase in the EITC: those with low education levels. Panel B presents participation rates for women with children and less than high school education, compared with women with the same level of education and no children, and also compared with more educated women with children. Panel C repeats the exercise for individuals with exactly twelve years of education. The participation rate before TRA86 was 47.9 percent for women with children and less than a high school education, compared with 78.4 percent for women without children and less than a high school education, and 91.1 percent for women with children and more than a high school education. After TRA86 there is an increase in the participation rate of 1.8 percentage points (from 47.9 percent to 49.7 percent) for the "less than high school" treatment group. There is a 2.3 percentage point *drop* in the participation rate of the first control group (females with less than high school education and no children). Taken together, these figures suggest a participation response of 4.1 percentage points. The second control group, females with children and more than high school education, has a small increase in participation of 0.9 percentage points, producing a difference-in-differences estimate that is also 0.9. Since many single women with children and more than high school education are eligible for the EITC and therefore are likely to be affected by its increase, it is not surprising that the second control group produces a smaller estimate of the treatment effect than the first control group. For the "high school" treatment group, shown in Panel C of Table II, the corresponding range of estimates is 1.4 to 2.5 percentage points.[11]

These results suggest that the labor force participation of unmarried heads of households increased following the Tax Reform Act of 1986. We do not observe a similar increase in the control groups. We observe larger percentage point responses among female heads with twelve or fewer years of schooling than among women with more education. This is encouraging since they are the most likely to be affected by the EITC.[12]

11. Because the level of participation for the treatment group differs from the level for the control group, the tax effect could be sensitive to the way in which we define the participation change. For example, we could find a greater percentage point increase in participation for the treatment group than for the control group, while finding a smaller percent reduction in nonparticipation. Because all of the without children control groups have either zero or negative changes in participation, our main qualitative results are not sensitive to the specification of the participation effect. However, our results comparing women with children and different levels of education are sensitive to the measure chosen.

12. Since the participation rate of the control group is so high (95 percent), a potential concern is that there is not much scope for the rate to rise after TRA86.

B. Regression Results

Because the treatment and the control groups differ in demographic characteristics, the observed differences in participation outcomes may reflect underlying differences between the treatment and control groups rather than a treatment effect. Controlling for demographic characteristics in a difference-in-differences approach is important if the composition of the treatment or control groups changes over time and some demographic characteristics are correlated with the dependent variable. In addition, controlling for demographic characteristics reduces the residual variance of the regression and produces more efficient estimates. Finally, by interacting demographic characteristics with a time dummy, we are able to reduce the chance that unknown shocks that differentially affect people with different characteristics are producing a false treatment effect.

We estimate the probit equation:

$$P(lfp_{it} = 1) = \Phi(\alpha + \beta \mathbf{Z}_{it} + \gamma_0 treatment_i + \gamma_1 post86_t + \gamma_2 (treatment \times post86)_{it}), \tag{1}$$

where *lfp* is a dummy equal to one if a woman reported working at least one hour during the previous year. In our basic specification, $\mathbf{Z}_{it}$ is a vector that includes unearned income, number of children, family size, number of preschool children, age and its square and cube, education and its square, and a dummy variable for race (=1 if nonwhite). $\mathbf{Z}_{it}$ also includes year dummies for 1984, 1985, 1989, and 1990. These variables control for observable differences in the characteristics of the treatment and control group that affect the level of labor force participation. Unobservable differences are controlled for by the variable, *treatment,* which is equal to one for any woman who has a child in her subfamily (and is therefore eligible for the EITC and likely to file as a household head). We expect γ_0 to be negative if women with children have

The evidence using the less than high school control group (with a participation rate of 78 percent) provides some reassurance on this point. In addition, we examined two other potential control groups: low-educated married women without children and low-educated single men without children. The labor force participation of the married women increased by 0.2 percent, from 83.9 to 84.1 percent, after TRA86, providing further evidence that the 2.3 percent increase observed for single women with children is larger than that observed for other groups in the economy. The labor force participation of single men rose from 93.5 percent of 94.5 percent. We take this as evidence that our methodology would have been capable of observing an increase in labor force participation by single women without children if one had occurred, even though they started from a high level of participation.

lower participation rates than their counterparts without children, even after controlling for other observable demographic characteristics. *post86* is a dummy equal to one for any tax year after 1986. γ_1 therefore reflects the average change in labor force participation for both treatment and control groups between 1986 and 1988, the omitted year-dummies in the regression.

A test of the impact of TRA86 is a test that eligible, unmarried women with children increased their participation after 1987 relative to unmarried women in the control group. It is a test that γ_2, the coefficient on the interaction term between *post86* and *treatment,* is greater than zero. Thus, our hypothesis tests are one-tailed tests (the ninety-fifth percentile of the t-distribution is 1.64).

Table III presents results in which we use the presence of children as our measure of eligibility for the EITC and the head of household filing status (*kids* replaces *treatment* in equation (1)). The sample is all unmarried women. The first column excludes demographic characteristics, while the second column includes them. The estimated coefficients on the four year dummies (not reported) and *post86* (γ_1) are small in magnitude and insignificant in both columns, suggesting that there is no overall trend in average participation for the two groups. The coefficient on *kids* (γ_0) changes dramatically once demographic characteristics are included: from -1.053 to -0.250. This result should not be surprising since females with children have different attributes than women without children. The fact that γ_0 remains significant even after controlling for observable characteristics suggests that having a child reduces labor force participation even controlling for observable demographic variables or that there are unobservable differences across the two groups. In spite of these differences, however, the treatment effect (γ_2) changes little when we include demographic characteristics as regressors: it rises from 0.069 to 0.074 (with a standard error of .030). This result suggests that any changes in the demographic composition of the treatment and control groups that occurred over time are uncorrelated with the treatment. The coefficients on the other demographic characteristics all have the expected signs. Females with unearned income have lower probabilities of participation, as do females with preschool children. Older women have lower probabilities of participation, as a cohort effect would predict. Finally, educated women are more likely to be in the labor force than less educated women (the quadratic term dominates the linear term for years of schooling of two or more).

The probit is a nonlinear model; therefore, the coefficients cannot be used directly as marginal effects. Since the treatment effect variable (*kids* $\times$ *post86* interaction) is discrete, we calculate the effect of the TRA86 by predicting two probabilities of participation, one with the interaction variable set equal to one and the other with the interaction term set equal to zero. The treatment effect is the average (over the sample of post-1987 women with children) of the difference in the two probabilities of participation. The last row in Table III presents estimates of the treatment effect. In column (2) we find that female heads had a 1.9 percentage point higher probability of participating in the workforce as a result of the combined impact of the expansion of the earned income tax credit and the other TRA86 reductions in tax liability for single women with children. The standard error on this estimate is 0.8 percentage points.[13]

C. Alternative Explanations

The basic finding from both the participation means and the regressions that the relative labor force participation of single women with children increased in the years after 1987 is consistent with TRA86 having a positive impact on labor force participation. However, there are a number of alternative explanations for this finding that need to be examined before we conclude that TRA86 is the most likely explanation for the increase in labor force participation.

Labor force participation rates for all women increased from 37.1 percent in 1959 to 57.4 percent in 1989. If long-run trends in labor force participation differ between females with and without children, then we risk interpreting preexisting differences in labor supply patterns as treatment effects. The top panel of Figure II shows the labor force participation rate for all unmarried females, aged 16 to 44, between 1981 and 1992. We present separate trends for women with and without children. The labor force participation rate for women without children does not appear to be trending either upward or downward during this period. The participation rate for women with children seems to be somewhat more sensitive to the business cycle. There also appears to be an

13. We use the delta method to calculate the standard errors.

TABLE III

PROBIT RESULTS: CHILDREN VERSUS NO CHILDREN ALL UNMARRIED WOMEN

	Sample: all unmarried women					
Variables	Without covariates (1)	Demographic characteristics (2)	Unemployment and AFDC (3)	State dummies (4)	Second child dummy (5)	Separate year interactions (6)
Coefficient estimates						
Other income (1000s)	—	−0.035 (.001)	−0.034 (.001)	−0.034 (.001)	−0.034 (.001)	−0.039 (.001)
Number of preschool children	—	−0.395 (.016)	−0.279 (.018)	−0.281 (.018)	−0.278 (.018)	−0.279 (.018)
Nonwhite	—	−0.422 (.016)	−0.521 (.030)	−0.520 (.031)	−0.518 (.031)	−0.518 (.031)
Age	—	−0.237 (.059)	−0.209 (.060)	−0.195 (.060)	−0.194 (.060)	−0.193 (.060)
Age squared	—	0.007 (.002)	0.006 (.002)	0.006 (.002)	0.006 (.002)	0.006 (.002)
Education	—	−0.020 (.014)	−0.029 (.014)	−0.029 (.014)	−0.029 (.014)	−0.029 (.014)
Education squared	—	0.010 (.001)	0.010 (.001)	0.010 (.001)	0.010 (.001)	0.010 (.001)
Second child	—	—	—	—	−0.118 (.040)	−0.117 (.040)
State Unemployment rate	—	—	−0.096 (.007)	−0.063 (.012)	−0.064 (.012)	−0.064 (.012)
State Unemployment rate kids × kids	—	—	0.028 (.010)	0.029 (.010)	0.029 (.010)	0.030 (.010)
Maximum monthly AFDC benefit	—	—	−0.001 (.000)	−0.001 (.000)	−0.001 (.001)	−0.001 (.000)

Kids (γ_0)	−1.053 (.020)	−0.250 (.029)	−1.403 (.106)	−1.438 (.108)	−1.458 (.110)	−1.462 (.110)
Post86 (γ_1)	−0.001 (.028)	0.019 (.031)	−0.152 (.067)	−0.104 (.069)	−0.094 (.069)	
Kids × Post86 (γ_2)	*0.069 (.027)*	*0.074 (.030)*	*0.103 (.037)*	*0.113 (.037)*	*0.087 (.043)*	—
Kids × 1988						*0.033 (.057)*
Kids × 1989						*0.116 (.058)*
Kids × 1990						*0.112 (.057)*
Second child × post86					0.051 (.043)	—
Log likelihood	−20759	−17105	−16793	−16633	−16629	−16626
Predicted participation response for treatment group		*.019 (.008)*	*.026 (.010)*	*.028 (.009)*	*.022 (.009)*	*.008, .029, .028 (.014), (.015), (.015)*

Data are from survey years 1985–1987 and 1898–1991 of the March CPS. The dependent variable is labor force participation. It equals one if the woman worked at least one hour during the tax year. *Post86* equals one for tax years 1988, 1989, 1990. *Kids* equals one if the tax filing unit contained at least one child. In addition to the variables shown, all regressions include year dummies for 1984, 1985, 1989, and 1990. Columns (2) through (6) also include variables for the number of children in the tax filing unit age-cubed. Columns (3) through (6) also include interactions of *age* and *nonwhite* with *post86* and with *kids*. Columns (4) through (6) also include a full set of state dummies. Column (6) also includes interactions of *second child* with the year dummies for 1988, 1989, and 1990. The number of observations is 67, 097. Standard errors are in parentheses. Regressions are weighted with CPS March supplement weights.

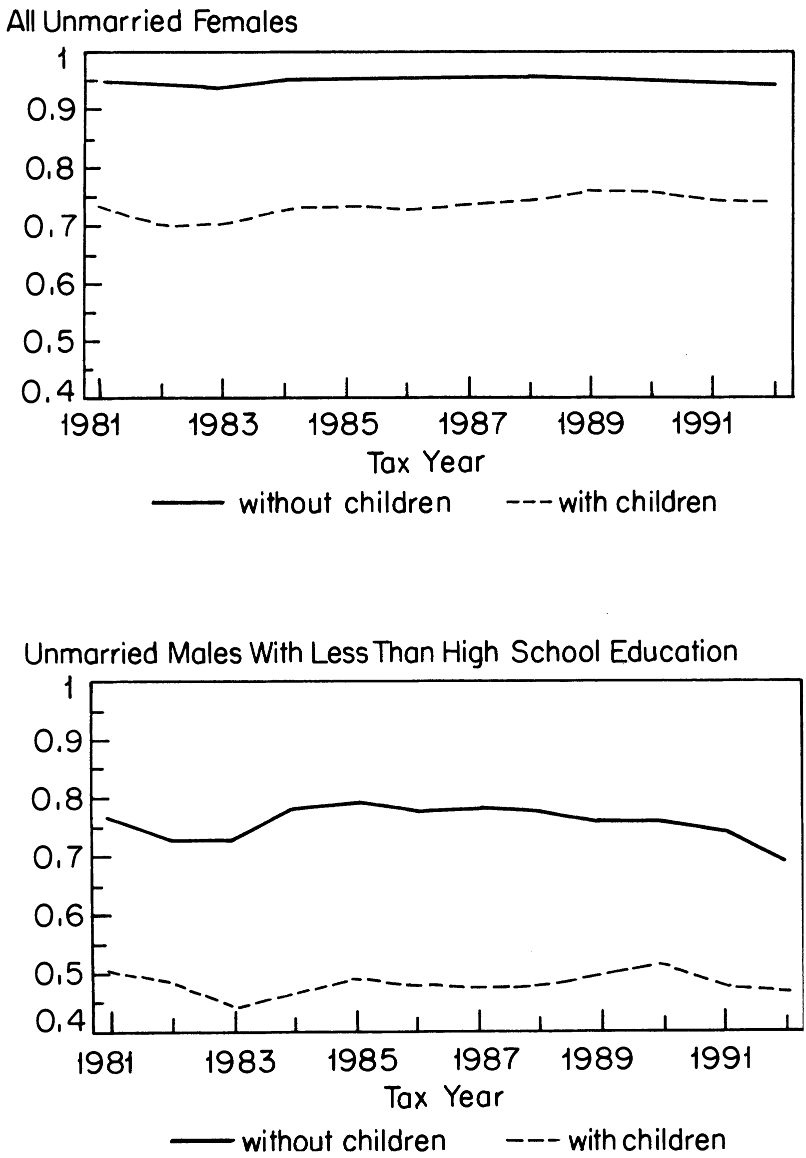

FIGURE II
Labor Force Participation Rates 1981 to 1992, Unmarried Females Ages 16–44

increase in labor force participation after 1986 for women with children, while the rate for women without children trends upward only slightly. The bottom panel of Figure II shows the same trends for women with less than high school education. Once again, there is no evidence that the two groups have different long-run trends.

In order to rigorously check these visual impressions, we estimated a probit regression of labor force participation on thirteen year dummies, a dummy for children, and interactions of the children and year dummies. To control for changes over time in the demographic composition of the sample, we also included all the demographic variables from column (2) of Table III. The marginal effects of the interaction variables represent annual deviations from the average difference in participation between females with children and females without children. These marginal effects and the maximum EITC are plotted in the top panel of Figure III for all women and in the bottom panel of Figure III for women with less than high school education. The two figures show quite clearly that the difference in participation rates between females with children and females without children declines (the coefficients become less negative) following the 1987 increase in the maximum credit. The participation rate difference seems to track the maximum EITC quite closely with a one- or two-year lag. It seems safe to conclude that the response estimated for the 1987 expansion does not reflect differing trends in the labor force participation of females with children and females without children. Indeed, the long-run evidence seems to confirm the conclusion that the relative labor force participation of women with children increased after 1986.

Another possible explanation for our finding that the relative labor force participation of single women with children increased after 1987 is that some other change occurred in the economic environment which affected women with children differently than women without children. Likely candidates are changes in state AFDC benefits, business cycle fluctuations, or unknown shocks that affect people with different demographic characteristics differently. While there was little change in national average AFDC benefits over our period of analysis, there was some cross-state variation in real benefits. For example, between 1986 and 1988, the maximum monthly benefit for a woman with two children increased from \$430 to \$503 (1992 dollars) in New Hampshire, and from \$505 to \$577 in Massachusetts. In New York, on

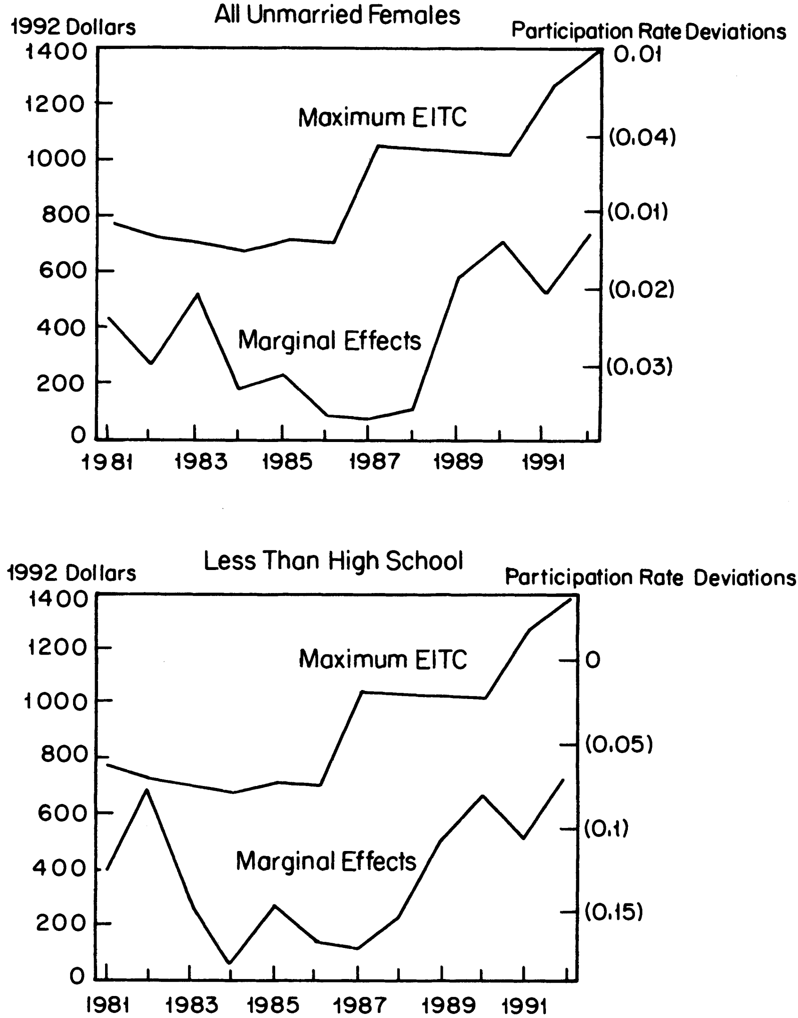

FIGURE III
Maximum EITC and Marginal Effects from KID × YEAR Dummies

the other hand, the maximum benefit fell from $533 to $495, and in California it fell from $638 to $606. The business cycle could be driving our results if there is a difference between single women with and without children in the sensitivity of their labor force participation to macroeconomic shocks. Between 1986 and 1988 the national unemployment rate for females fell by 1.8 percentage points, from 7.1 to 5.3 percent. Since both a reduction in the unemployment rate and an increase in the EITC should increase labor force participation, it is not possible to isolate the effects of the credit from the effects of the business cycle using the national unemployment rate. However, research has shown that the employment and earnings status of less educated, younger workers is closely related to state and local labor market conditions [Bartik 1991; Freeman 1991]. Therefore, we use state unemployment rates to purge the effects of general business cycle movements from our treatment effects. Finally, it is possible that the measured EITC response is the result of unknown shocks that are correlated with demographic characteristics that differ between the treatment group and the control groups. For example, nonwhite women may have been induced to enter the labor force during this period for reasons other than TRA86. We have no good story for why this might have happened, perhaps a shock to tastes for work, or perhaps changes in incentives that we have not captured. In any case, since unmarried women with children are more than twice as likely to be nonwhite than are unmarried women without children (37 percent versus 15 percent), such shocks could explain our results. To address these concerns, we include interaction terms between the time dummy and age and race.

Columns (3) and (4) of Table III display results including state AFDC benefits, state unemployment rates, and the interactions between demographic characteristics and time. The unemployment rate is negatively correlated with labor force participation as is the level of monthly AFDC benefits. Surprisingly, the interaction between the unemployment rate and *kids* is positive, suggesting that women with children are less sensitive to the business cycle. The treatment effect, *kids* × *post86,* rises after controlling for the alternative explanations. The predicted participation response increases from 1.9 percentage points in column (2) to 2.6 percentage points in column (3). When state dummies are added in column (4), the estimated response increases further to 2.8 percentage points. Thus, it does not appear that the alternative explanations we have considered here can account for the relative increase in participation that we observe following TRA86.

D. Was the EITC the Cause?

Three other pieces of evidence increase the likelihood that the observed effect was due to the EITC and not to other parts of TRA86 or other government policies. First, the increase in participation is mostly a response to the return to the first child in the tax unit. In the period we study, the amount of EITC a taxpayer received depended only on having a child. No additional benefit accrued from having only one child. Similarly, the advantages of the head of household filing status come from the initial child. In contrast, additional dependent exemptions are available for each additional child. Thus, if families with multiple children were more likely to increase their labor force participation than families with more than one child, then this part of the response was due to the expansion of the dependent exemption and not to the EITC. To disentangle the EITC and head of household effect from the dependent exemption effect, we estimate a regression in which we interact a *second child* dummy with the *post86* dummy. Column (5) of Table III shows that after including the second-child effect, there is still a 2.2 percentage point effect attributable to the first child.

Second, the timing of the post-1987 participation increase is consistent with the result being due to the increase in the EITC. The top panel of Figure III indicates that there was little relative increase in participation by women with children until 1989. The bottom panel indicates that for women with less than high school education, there was some increase in 1988, but most of the increase occurred in 1989. Column (6) of Table III estimates the magnitude of the individual year effects. By 1988 single women with children had increased their relative labor supply by only 0.8 percentage points, but in 1989 and 1990 the impact reached 2.9 percentage points. This timing is consistent with the response being due to the increase in the EITC. Most EITC recipients would have first become aware of the increase around April of 1988 when they received their 1987 tax refund. Assuming that it takes some time to adjust to new incentives, we would expect to have seen a limited response in 1988, and a full response in 1989. Other aspects of TRA86 appeared in weekly paychecks during 1987 and would be expected to have provoked a more rapid response. The finding that most of the increase in relative participation rates occurred in 1989 is evidence that the increase was not caused by the Family Support Act of 1988. States were not required to implement many of the key provisions of the Family Support Act until mid-1990 [Committee on Ways and Means 1994], so we would have expected it to have had a larger impact in 1990 than in 1989.[14]

The third piece of evidence that the effect we observe is due to the EITC is that it had its largest effect among people most likely to be eligible for the credit. Columns (1) through (3) of Table IV present results with the sample separated by years of education. The specification is the same as column (5) of Table III. The predicted participation response is 6.1 percentage points for the less than high school sample, 2.6 percentage points for the high school sample, and only 0.4 percentage points for the beyond high school sample.[15] When we separate the sample by predicted income region, we obtain similar results.[16] The 86 percent of the sample whom we predict to have earnings in the EITC range have a predicted participation response of 3.6 percentage points, while the predicted high-income individuals have a participation response of −0.7 percentage points.

V. The Impact of the EITC on Hours Worked

A. Basic Hours Results

The results presented in the previous section show that the relative labor force participation of single women with children increased following TRA86 and suggest that the EITC could have been the cause of this participation increase. However, the EITC expansion is predicted to have reduced the hours worked by many single women with children already in the labor force. Thus, the total impact of the EITC on hours worked is theoretically ambiguous.

14. Some states expanded Medicaid access for families with small children during the years studied in this paper [Yelowitz 1995]. As we explained in footnote 8, restricting our sample to families with children over five years of age does not change our results, so these Medicaid expansions cannot be the source of our findings.

15. A difference-in-differences regression of less than high school versus more than high school, women with children versus women without children, and pre-1986 versus post-1986 (using the same covariates as in Table IV) generates a predicted participation response of 10.6 percentage points.

16. Since the low education groups do not correspond exactly to the EITC eligible population, we estimate an earnings equation using the sample of earners prior to 1987. We estimated an OLS regression of earnings on family size, number of preschool children, the state unemployment rate, and 28 age dummies, 10 education dummies, 2 year dummies, and 1 race dummy. Using the estimated coefficients and individual characteristics, we predict earned income for each woman in the sample.

Table IV
PROBIT RESULTS: CHILDREN VERSUS NO CHILDREN
DIFFERENT SUBSAMPLES

Variables	Sample: Less than high school (1)	High school (2)	Beyond high school (3)	Predicted earned income in EITC range (4)	Predicted earned income above EITC range (5)
Coefficient estimates					
Kids (γ_0)	−0.663 (.202)	−1.551 (.164)	−1.352 (.264)	−1.427 (.126)	−1.071 (.357)
Post86 (γ_1)	−0.232 (.126)	−0.040 (.105)	0.188 (.158)	−0.022 (.078)	−0.151 (.221)
Kids × Post86 (γ_2)	*0.181 (.083)*	*0.103 (.062)*	*0.030 (.098)*	*0.137 (.049)*	*−0.048 (.119)*
Log likelihood	−5052	−7723	−3380	−13845	−2612
Number of observations	9354	26,229	31,514	51,535	15,562
Predicted participation response for treatment group	*.061 (.024)*	*.026 (.014)*	*.004 (.011)*	*.036 (.012)*	*−.007 (.016)*

Data are from survey years 1985–1987 and 1989–1991 of the March CPS. The dependent variable is labor force participation. It equals one if the woman worked at least one hour during the tax year. *Post86* equals one for tax years 1988, 1989, and 1990. *Kids* equals one if the tax filing unit contained at least one child. In addition to the variables shown, all regressions include all the variables from the specification in column (5) of Table III. Standard errors are in parentheses. Regressions are weighted with CPS March supplement weights.

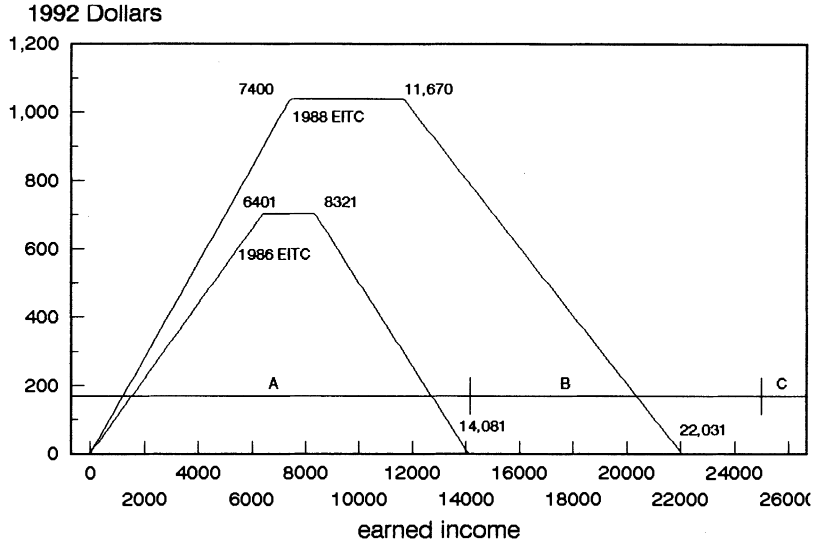

FIGURE IV
1986 and 1988 Earned Income Tax Credit

Figure IV displays the 1986 and 1988 earned income tax credits (in 1992 dollars) as functions of income. The predicted impact of the EITC expansion on hours of work depends on the taxpayer's income. For most workers in region A (incomes between \$0 and \$14,081), the EITC expansion is predicted to have an ambiguous impact on hours of work since the expansion had offsetting income and substitution effects. Workers in region B (incomes between \$14,081 and \$25,000) are predicted to reduce their hours of work because they are either in the expanded phaseout region and face a 10 percent higher marginal tax rate in addition to having their incomes increased or because they have incomes just beyond the expanded phase-in region and might reduce their hours of work to take advantage of the credit. Workers in region C (incomes above \$25,000) are unlikely to be affected by the increase in the credit.[17]

17. The TRA86 tax rate changes reinforced the effect of the EITC on the hours of work of household heads relative to single filers. TRA86 reduced marginal tax rates by between three and eight percentage points for most single taxpayers with incomes in the EITC phaseout range, while reducing marginal tax rates for household heads by only two to three percentage points. Thus, the substitution effect from TRA86 should cause a larger increase in hours from single taxpayers than from household heads. In addition, as we explained in the participation section, the new TRA86 brackets, through their interaction with the in-

To examine how the EITC expansion affected hours conditional on working and total hours, we estimate OLS regressions that are similar to the probits that we used in Section IV. Thus, we estimate

$$(2)\quad \mathit{Annual\ Hours}_{it} = \alpha + \beta\mathbf{Z}_{it} + \gamma_0 \mathit{kids}_i + \gamma_1 \mathit{post86}_t + \gamma_2(\mathit{kids} \times \mathit{post86})_{it} + \varepsilon_{it},$$

where **Z** is a vector of demographic variables (with all the variables from the specification in column (5) of Table III), *kids* equals one for unmarried women with children, and the key coefficient is γ_2, the coefficient on the *kids* $\times$ *post86* interaction. When we examine the distribution of hours conditional on hours exceeding zero, we are implicitly assuming that any EITC-caused increase in participation in the post-1987 period did not alter the hours distribution. We choose not to impose a selection model on the data for two reasons. First, to identify a selection model, we would need a policy shift that affects participation separately from hours of work. TRA86 does not provide us with such a shift. Therefore, any attempt to estimate a selection model would be heavily dependent on the specification chosen. Second, recent research suggests that inferences in labor supply models are extremely sensitive to the model chosen [Mroz 1987; Zabel 1993]. Our failure to account for new participants should bias upward our estimates of the reduction in hours due to the EITC (i.e., make them less negative). New participants are likely to enter the labor force with earnings and hours below what we predict from their exogenous characteristics. This will occur if unobserved factors (such as a greater taste for leisure) that explain their nonparticipation compared with others with the same exogenous characteristics also cause them to choose fewer hours of work.

In column (1) of Table V the coefficient on the interaction term is 25.22 (with a standard error of 15.18), suggesting that contrary to the predictions of theory, women with children increased their relative hours conditional on working by a small amount. In column (2) the sample is restricted to women with less than high school education. Here there is essentially no change in relative hours for single women with children. Further

creased dependent exemptions and standard deductions, reduced tax liability by more for head of household filers than for single filers. Thus, the tax bracket income effect works in the same direction as the EITC increase, and hours of work by household heads should fall relative to hours of work of single taxpayers.

TABLE V

HOURS AND WEEKS REGRESSIONS: CHILDREN VERSUS NO CHILDREN

Dependent variable:	Annual hours	Annual hours	Annual hours	Annual hours	Annual weeks	Annual weeks
Variables	All single women with hours > 0 (1)	Less than high school with hours > 0 (2)	All single women (3)	Less than high school (4)	All single women with hours > 0 (5)	All single women (6)
Coefficient estimates						
Other income (1000s)	−21.83 (.61)	−26.81 (2.93)	−29.92 (.62)	−56.65 (2.46)	−0.433 (.012)	−0.670 (.014)
Number of preschool children	−66.28 (10.42)	−72.21 (25.57)	−136.49 (9.18)	−107.94 (16.92)	−1.833 (.214)	−3.944 (.207)
Nonwhite	−140.94 (11.77)	−142.84 (41.29)	−209.80 (12.43)	−266.32 (36.14)	−2.680 (.241)	−4.788 (.281)
Age	786.82 (22.38)	475.01 (64.29)	576.16 (23.59)	211.04 (54.87)	13.743 (.459)	9.391 (.533)
Age squared	−21.45 (.75)	−12.62 (2.21)	−15.12 (.80)	−4.79 (1.89)	−0.385 (.015)	−0.252 (.018)
Education	56.69 (6.41)	14.22 (17.07)	114.90 (6.14)	−56.03 (15.03)	1.262 (.132)	3.086 (.139)
Education squared	−1.58 (.25)	−0.21 (1.22)	−2.22 (.24)	5.97 (1.05)	−0.041 (.005)	−0.068 (.006)
Unemployment rate	−9.98 (3.85)	−31.37 (14.58)	−15.94 (4.15)	−42.24 (13.00)	−0.130 (.079)	−0.304 (.094)
Unemployment rate × kids	5.27 (4.17)	33.60 (13.44)	1.33 (4.14)	34.40 (11.10)	0.054 (.086)	−.065 (.094)
Maximum monthly AFDC benefit	−0.22 (.06)	−0.10 (.18)	−0.54 (.06)	−0.14 (.14)	−0.005 (.001)	−.014 (.001)
Kids (γ_0)	−83.03 (47.82)	−249.44 (132.61)	−186.48 (46.65)	−327.07 (110.24)	−6.856 (.981)	−11.420 (1.054)
Post86 (γ_1)	−29.95 (23.61)	63.27 (78.03)	−45.33 (25.20)	−56.27 (69.26)	0.722 (.484)	0.222 (.569)
Kids × Post86 (γ_2)	*25.22 (15.18)*	*2.98 (46.04)*	*37.37 (15.31)*	*83.83 (39.42)*	*.126 (.311)*	*.560 (.346)*
Observations	59,474	5700	67,097	9354	59,474	67,097

Data are from survey years 1985–1987 and 1989–1991 of the March CPS. *Post86* equals one for tax years 1988, 1989, and 1990. *Kids* equals one if the tax filing unit contained at least one child. In addition to the variables shown, all regressions include year dummies for 1984, 1985, 1989, and 1990; variables for the number of children in the tax filing unit; age-cubed; interactions of *age* and *nonwhite* with *post86* and with *kids*; and a full set of state dummies. Standard errors are in parentheses. Regressions are weighted with CPS March supplement weights.

results, separating the sample into predicted income regions, find no evidence that the expansion of the phaseout region reduced hours of work for EITC eligible women [Eissa and Liebman 1995].

When we include the participation effect and look at total hours, the interaction coefficient increases from 25.22 to 37.37 for all women and from 2.98 to 83.83 for women with less than high school education. The 81-hour increase for the less than high school educated single women with children is consistent with our earlier finding that the participation rate for this population increased by 6.1 percentage points. Multiplying the increase in participation by average hours conditional on working for the less than high school population (1264) results in a total increase in hours of 77, quite close to the result from the total hours regression. Results for weeks worked, presented in columns (5) and (6) convey a similar story. There was little change in the conditional distribution of weeks worked after TRA86, and there was a larger increase in unconditional weeks worked.

B. Why Do We Observe a Participation Effect But No Hours Effect?

Economic theory suggests that the 1987 expansion of the EITC should have increased labor force participation and reduced the hours worked by EITC recipients who were already working. Our finding that the expansion did indeed increase labor force participation, but did not reduce hours worked is somewhat puzzling. We offer four explanations.

First, it is common for studies of labor supply to find that labor force participation responds more than hours of work to a change in the net wage [Mroz 1987; Zabel 1993; Triest 1992]. Second, there is strong evidence that many EITC recipients do not know that they receive the credit, and that even those who are aware of it do not understand how it works.[18] Taxpayers do not have to know about or understand the EITC for it to affect their labor force participation, they only have to perceive that they are better off while working than they were on welfare. Since almost

18. Interviews we conducted during August 1993 in Cambridge, Massachusetts, among potential recipients suggested virtually no awareness of the credit (see Eissa and Liebman [1993] for details). This observation was confirmed by the experience of one author (Liebman) as an IRS VITA volunteer in March and April 1994, which revealed that even past recipients were often unaware of the credit. More extensive interviews conducted in Chicago and described in Olson and Davis [1994] similarly found low awareness and understanding of the credit.

all recipients of the EITC receive the credit in a single payment as part of their annual tax refund check and not as part of their weekly paychecks, it is possible that recipients perceive it as a lump sum benefit. In this case the EITC would be predicted to have a positive impact on labor force participation, but only a small negative impact on hours worked via the income effect. Third, it is easier to measure participation than hours worked. If workers report round numbers for hours worked, it will take a large change in hours before the change is noticeable in the data. Fourth, since we observe both participation and hours of work increasing for single women with children relative to single women without children, it is possible that some unknown positive shock can explain our findings.

VI. Conclusion

The 1987 expansion of the EITC and other aspects of the Tax Reform Act of 1986 reduced the relative tax liabilities of EITC-eligible household heads by up to $1186 (1992 dollars). We estimate that this expansion increased labor force participation among all single women with children by up to 2.8 percentage points, from 73.0 to 75.8 percent. Among single women with children and less than high school education, the impact was even greater—6.1 percentage points. While there are a number of possible explanations for this evidence, we find the combined impact of the 1987 expansion of the EITC and the other provisions of TRA86 to be the most convincing explanation.

Between 1990 and 1996 the maximum earned income tax credit increased from $1023 to $3200 (1992 dollars) for a family with two children. Since our methodology did not allow us to estimate the underlying preference parameters of our sample, we cannot make precise predictions of the participation response to the more recent expansions. Our evidence suggests, however, that the recent expansions of the EITC will increase participation by female household heads. There may be decreasing returns to EITC expansions, however, if the nonparticipating population remaining after each increase is farther from the participation-nonparticipation margin.

When we apply our same methodology to hours of work, we find no evidence that the expansion of the EITC decreased hours of work for people already in the labor force. While our finding that the 1987 expansion of the EITC did not decrease hours of work is encouraging, we think it will be important to reexamine this issue as the EITC expands. Awareness of the EITC is likely to increase as the maximum credit triples, and this could result in a greater sensitivity to the marginal tax rate imposed by the phaseout of the credit. In addition, since the lump sum payment of the EITC may explain the lack of hours responsiveness, it would be unwise to apply these results to other increases in marginal tax rates that operate through regular payroll deductions.

One final point is in order. A full evaluation of a transfer program like the EITC requires more than just an estimate of the distortionary impact of the program on the labor supply of transfer recipients. It also requires information on the value of the additional income received by program beneficiaries as well as the change in the amount of leisure that they consume. This must be balanced against the net income lost by taxpayers and the associated deadweight losses. Since both the welfare payments and the taxes involve deadweight losses, the desirability of the program depends on the weights assigned to changes in income at different income levels. A full comparison among alternative tax and transfer systems would also evaluate the technology of compliance and administration [Slemrod 1990]. This is particularly true in the case of the EITC where the tax system is performing functions that have traditionally been the responsibility of the welfare system [Alstott 1995].

Ultimately, the earned income tax credit is an income transfer program. Compared with other elements of the welfare system, the EITC appears to produce little distortion of work incentives. Therefore, if policy-makers want to redistribute income to the working poor and are comfortable with the trade-offs involved in using the tax system rather than the welfare system to administer transfers, the EITC seems to be a way to do so with minimal efficiency costs.

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