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The Effects of the 1993 Earned Income Tax Credit Expansion on the Labor Supply of Unmarried Women

Kampon Adireksombat[1]

Abstract

The Earned Income Tax Credit (EITC) expansion in 1993 has substantially increased the benefit available to a family with two or more children compared to a family with one child and to a family with no children. Using national survey data and this differential increase in EITC benefits, this study examines the effect of the 1993 EITC expansion on the labor supply of unmarried women. I find that the 1993 expansion has substantially increased the labor force participation of those women with two or more children. Moreover, the increase in the participation rate was mainly from less-educated women, the target population of the EITC program. Regarding the hours of work, I find evidence that the expansion increased total hours worked by all unmarried women. However, I find

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no evidence of statistically significant changes in annual hours worked by currently unmarried female workers.

1. Introduction

The Earned Income Tax Credit (EITC) is a refundable income tax credit instituted in 1975 that targets low- and middle-income working families in the United States. The tax credit is paid as a lump sum along with the annual tax return. Working as an earnings subsidy, in theory, an expanded EITC will encourage labor force participation but may increase or decrease hours worked by EITC-eligible taxpayers who are already in the labor force, depending on the range of the EITC in which their income falls before the expansion. As a result, the EITC effect on total hours of work is an empirical question.

Due to a substantial increase in the labor force participation of unmarried women during the 1990s, and to avoid the complex joint labor supply decisions of husband and wife, most of the existing EITC studies focus on the labor supply decisions of unmarried women (with the exception of Dickert, Houser, and Scholz 1995; Eissa and Hoynes 2004; Heim 2005). Using the different amounts of tax credits available to families with children and those without children as the identification strategy, the previous studies of the labor supply response to the EITC find that its expansions increased the labor force participation of single mothers. However, they do not find statistically significant effects on hours worked.[1]

With a substantial expansion of the EITC program in the 1990s, the EITC has become the largest cash-transfer program for low-income families in the United States. Between 1990 and 2000, real spending on the EITC increased from $11.3 billion to $36.6 billion (in 2005 dollars). In 2000, more than 19.2 million families benefited from the tax credit. The rapid growth of the EITC is attributable to its expansion in 1993, as part of the Omnibus Budget Reconciliation Act of 1993 (OBRA-93). From 1994 to 1996, when the 1993 expansion was fully phased in, the EITC costs the federal government more than $96.9 billion (U.S. House of Representatives 2004).

OBRA-93 significantly increased the maximum credits available to a family with two or more children relative to those given to a family with

one child or no children. In 2005 dollars, the difference between the maximum credits available to a family with two or more children and a family with one child rose from $105 in 1993 to $1,745 in 1996, when OBRA-93 became fully effective. Likewise, relative to the case of a family with no children, the difference rose from $2,042 in 1993 to $4,024 in 1996. The expansion also substantially increased the subsidy rate and the beginnings of the phase-out range for a family with two or more children. From 1993 to 1996, the relative difference between the subsidy rate available to a family with two or more children and that available to a family with one child increased from 1 to 6 percentage points. Compared to the case of a family with no children, the difference in the subsidy rate rose from 19.5 to 32.35 percentage points. Moreover, the relative size of the flat range, the phase-out rate, and the income cutoff for receiving the EITC were expanded substantially for a family with two or more children relative to a family with one child or no children.

The purpose of this study is to examine the effectiveness of the 1993 EITC expansion in increasing the labor supply of unmarried women. To identify the effect, this study uses a differential expansion in the EITC that favored a family with two or more children over a one-child family and a childless family. Thus, I test whether the 1993 EITC expansion resulted in differential changes in the labor supply of unmarried women with two or more children (the TwoPlus group) compared to those with no children (the NoChildren group) and those with one child (the OneChild group).

To examine the effect of the EITC on hours worked, previous studies focus on hours worked by those who are already working and find that the EITC has a slightly negative effect on hours worked by current workers (Hotz and Scholz 2003). Instead, this study focuses on the net effect of the EITC on total hours worked by all unmarried women. Moreover, this study accounts for the major welfare reform of 1996, which is another important government policy that significantly encourages labor supply among low-income people.[2] Failure to control for welfare reform may overestimate the effects of the EITC expansion.

Using data from the March Current Population Survey (CPS) during the 1990s, results suggest that after the 1993 EITC expansion, the TwoPlus group increased its probability of labor force participation relative to the NoChildren and the OneChild groups by 5.0 and 4.3 percentage points, respectively. These increases are concentrated in the labor markets for unmarried women with no college education. However, between the NoChildren and the OneChild groups, I do not find any statistically significant change in labor force participation. These findings are consistent with

Hotz, Mullin, and Scholz (2006), who use Californian data to examine the EITC effects on the labor market participation.

For the effect on the hours worked by all unmarried women, the tobit estimates suggest that on average the TwoPlus group increased its total annual hours worked (per person) relative to the NoChildren and the One-Child groups by 97.9 and 81.1 hours, respectively. However, when I restrict the sample to examine only the hours worked by those who were already in the labor force, consistent with existing studies, I do not find any statistically significant change in their annual hours worked in all groups.

The remainder of this article proceeds as follows. Section 2 discusses the structure of the EITC and its effect on labor supply. Section 3 reviews the previous work on the labor supply response to the EITC. Section 4 describes the data and empirical approach used in this study. Section 5 describes the regression specification and provides results. Section 6 concludes.

2. Institutional Details and Theoretical Prediction

2.1. The EITC Structure and Its History

Figure 1 presents the EITC structures in place during the 1990s. The credit equals a specified percentage of earned income up to a maximum dollar amount over the "phase-in range." Within a range of income termed the "plateau range," taxpayers receive the maximum credit. The credit then diminishes to zero over the "phase-out range." The EITC is refundable, and claimants are paid regardless of whether the credit-qualified taxpayer has any federal income tax liability. The EITC payment is typically made once a year as an adjustment to tax liabilities or refunds.[3]

The EITC has provided tax reductions and earning subsidies for low- and middle-income working families since 1975. The EITC payments were eroded by inflation until the Tax Reform Act of 1986 (TRA-86) increased the maximum credit in 1987, to have a real value equal to that of the credit in 1975 and indexed the EITC value for inflation. The Omnibus Budget Reconciliation Act of 1990 (OBRA-90) introduced differential credit rates and maximum credits available to families with one child and families with two or more children. However, it was OBRA-93 that substantially increased the maximum credit available for a family with two or more children, relative to one with no children and one with one child. OBRA-93 also expanded the beginning and ending incomes of the "phase-out range." The real values of the maximum credit available to a family with two or more children increased substantially between 1994 and 1996, becoming fairly
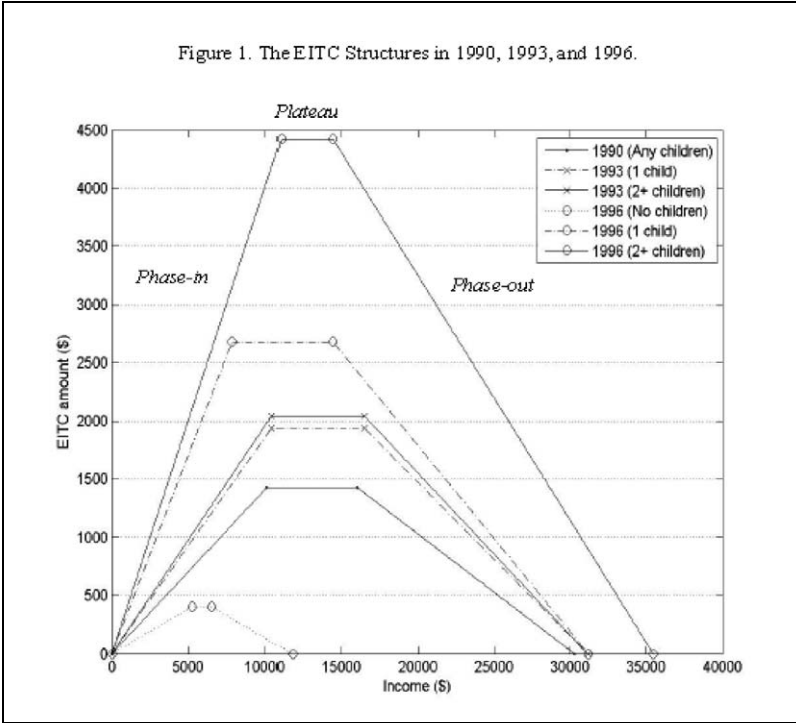
Figure 1. The EITC structures in 1990, 1993, and 1996.
Source: Authors' calculations from the House Ways and Means Committee Green Book (2004)

constant afterward, as the reform was fully phased in. For a family with one child and a family with no children, the maximum credits increased after OBRA-93 was implemented, and they become constant after 1994.

In addition, the difference between the subsidy rates for families with one and those with two or more children increased from 1 percentage point in 1993 (18.5 and 19.5 percent, respectively) to 6 percentage points (40 and 34 percent, respectively) in 1996. Sharing the same phase-in and phase-out incomes in 1993, the end of phase-in and phase-out ranges increase by $3,187 and $4,253 (in 2005 dollars) for a family with two or more children relative to those for a family with one child.

Due to the structure of the EITC, it primarily affects less-educated, unmarried women (Meyer 2002; Dahl and Lochner 2005; Baughman and

Dickert-Conlin 2009). Thus, this study focuses on the effect of EITC on the labor supply of unmarried women.

2.2. Theoretical Predictions

From the perspective of the static labor–leisure model, the EITC expansion affects the intensive and extensive margins of the labor supply of unmarried women.

For a nonworker who was out of the labor force before the expansion, the static labor–leisure model predicts that the EITC expansion will expand her budget set when she enters the labor force. With no earned income before the expansion, there will be only a positive substitution effect but no income effect due to an increase in the effective wage (marginal value of working). As a result, some will choose to participate in the labor force.

For a worker who was already in the labor force, the effect of the expansion on her hours of work is ambiguous, depending on the range of EITC in which her income falls before the expansion.[4] If her income falls in the "phase-in range," in theory, there will be a positive substitution effect and a negative income effect, assuming that leisure is a "normal good." Thus, the net effect is ambiguous. If her income falls in the "flat range," there is only a negative income effect; consequently, the expansion leads to a decrease in hours of work. If her income falls in the "phase-out range," a diminishing credit implies a lower effective wage relative to the absence of the EITC. This negative substitution effect results in a reduction in hours of work, as does the negative income effect. Finally, if her income was beyond the credit region, she may decide to reduce her hours of work to be eligible for the credit.

With a substantial increase in the EITC benefits that favored a family with two or more children, in theory, assuming that the labor supply elasticity differs by family size, there will be a relatively larger increase in the labor force participation of the TwoPlus group compared to that of the other groups. For the effect on hours worked by current workers, if their incomes fall in the "flat range" or the "phase-out range," the TwoPlus group will reduce its hours of work more than the other groups will. If their incomes fall in the "phase-in range," the effect is ambiguous due to a positive substitution effect and a negative income effect.

Theories predict that EITC has an unambiguously positive effect on unmarried women's labor force participation. However, the effect on hours worked by current workers is ambiguous. Moreover, among new workers, employment may only be offered in discrete quantity categories

(part-time vs. full-time jobs). Therefore, the EITC effect on total hours of work is an empirical question.

3. Literature Review

In general, existing studies find a positive effect of EITC expansion on the labor force participation of unmarried women. On the intensive margin, focusing on those who were already in the labor force, they do not find statistically significant effects on hours worked. Categorized by econometric methods, there are three strands of the previous work.

Using structural models, Keane (1995) and Keane and Moffitt (1998) examine the EITC effect on the labor supply of single mothers. They find that the EITC expansions between 1984 and 1996 led to an increase in the labor force participation of single mothers by 10.7 percentage points, from a base of 64.7 percent. In addition, they find that the expansions led to an increase in weekly hours of work from 24.1 to 26.5 hours.

The second method is the quasistructural model. To identify the effect on the EITC, this method uses variation in effective wages or effective tax rates. Using the 1990 Survey of Income and Program Participation (SIPP), Dickert, Houser, and Scholz (1995) examine the effect of the EITC on the labor supply of single parents and couples. Results from their simulation model show that the EITC expansion in 1993 increased the labor force participation of single-parent families by 3.3 percentage points. Using data from the 1984-1996 CPS, Meyer and Rosenbaum (2001) find that the EITC and other tax changes increased annual employment of single mothers by 7.2 percentage points, relative to single women with no children.

The last method is the reduced-form model, which is the method I use in this study. The reduced-form model is commonly referred to as the natural experiment or the difference-in-difference (DID) approach. The advantage of this approach is simplicity and transparency in the assumptions that allow the identification of key parameters.

For example, Eissa and Liebman (1996) use a DID approach with a treatment group of single women with children and a control group of those with no children to examine the effect of the 1986 EITC expansion on the labor supply of single women. Using the March CPS data from 1985 to 1991, they find that the expansion resulted in a 2.8 percentage point increase (from a base of 74.2 percent) in the labor force participation of the treatment group compared with that of the control group. However, they do not find any statistically significant change in annual hours worked by those single women who were already in the labor force. Neumark and Wascher (2001) use

federal- and state-level variation to evaluate the effectiveness of EITC in raising the earnings of poor and low-income families and examine their effect on changes in earned income and employment. Using the 1986-1995 March CPS data, the estimates, which are based on the state credit rate, suggest that the EITC increased the labor force participation of those who had not worked before but decreased hours worked by those who were already in the labor force. However, the estimates based on the federal rate do not suggest consistent results. Focusing on the effects of time limits on the welfare use, work, and income of single mothers, Grogger (2003) also examines the effects of EITC. Using variation in the maximum credits between family sizes, he finds that the EITC has a substantial effect on the employment of single mothers. His estimates suggest that a $2,000 increase in the maximum credit, such as that enjoyed by women with two or more children after the 1993 expansion was fully phased in, results in a 7.2 percentage point increase in employment. Regarding weeks of work, this $2,000 increase in the maximum credits raises weeks worked by 2.5 weeks.

To avoid bias due to changes in the composition of treatment and comparison groups in repeated cross-sectional studies, Hotz, Mullin, and Scholz (2006) use longitudinal data between 1991 and 2000 from California to examine the effect of the EITC on the labor market participation of single-parent families on welfare. Taking advantage of the longitudinal data, their empirical approach controls for covariates and household-specific fixed effects. They find that the 1993 EITC expansion resulted in an increase in employment by as much as 3.4 percentage points for families with two or more children relative to families with one child. Focusing on Wisconsin's supplement to the federal EITC for families with three or more children, Cancian and Levinson (2006) examine the effects of Wisconsin's EITC supplement on employment and hours worked by comparing women with two and three children from Wisconsin and from states without EITC supplements. Unlike previous studies, they find no effect of the EITC on employment or hours worked.

To identify the effect of the 1993 EITC expansion on the intensive and extensive margins of the labor supply of unmarried women, this article extends the existing literature by using national survey data and a differential increase in EITCs available to the TwoPlus group relative to the NoChildren and OneChild groups.[5] In addition, this study accounts for welfare reform and focuses on the net effect of the EITC expansion on hours worked by all unmarried women.

By selecting a sample based on marital status and using the number of children as a source of identification, I assume that marriage and fertility

decisions are exogenous to the EITC expansion. This is a reasonable assumption. Existing research suggests that these decisions are exogenous to the EITC (Ellwood 2000; Dickert-Conlin and Houser 2002; Baughman and Dickert-Conlin 2009).

4. Data and Empirical Approach

I use data from the March CPS Annual Demographic File. The CPS is the monthly survey of unemployment and labor force participation of about 50,000 households, including labor market and income information for the previous year. The sample period of this study corresponds to the tax years 1991-1993 and 1995-2000.[6]

The sample includes unmarried women who were aged twenty-five to fifty-five years, were not self-employed, and had filed either head-of-household or single tax returns, depending on whether they had dependents.[7] I exclude those aged younger than twenty-five years because of the concern that many of them were still in school and because childless women must be between the ages of twenty-five and sixty-five to be eligible for the credit. I exclude those aged over fifty-five because they are less likely to participate in the labor force. The sample size, after pooling all nine years, is 86,044 observations.

In addition to the number of children, following findings from EITC eligibility literature that women with no college degree are more likely to be eligible for the EITC, I also categorize the sample into four groups by their levels of education: *less than high school, high school, some college*, and *college* (see Dahl and Lochner 2005; Baughman and Dickert-Conlin 2009). Therefore, I expect that less-educated women will increase their labor supply compared to the *college* group.

Table 1 presents descriptive statistics for my sample categorized by the number of children and before and after 1994. After 1994, all women in my sample tend to attain higher education, be older, be more likely to participate in the labor force (with the exception of the NoChildren group), increase their hours worked (both current workers and all women), have fewer preschool children, and have higher earned income and income from other sources (with the exception of the TwoPlus group). Moreover, those in the sample from after 1994, which also includes the period after welfare reform, tend to be eligible for smaller Aid to Families with Dependent Children (AFDC)/Temporary Assistance to Needy Families (TANF) benefits but receive higher child tax credits. It is also worth noticing that the Two-Plus group, on average, tend to attain lower education than the OneChild

Table 1. Summary Statistics

	Before 1994			After 1994		
	No children	One child	Two plus	No children	One child	Two plus
Education						
Mean	13.80	13.02	12.47	13.99	13.34	12.75
Std. dev.	2.90	0.26	2.76	2.78	2.67	2.70
Age						
Mean	35.45	36.34	34.38	39.44	37.29	35.17
Std. dev.	9.38	7.50	6.26	9.50	7.74	6.46
Labor force participation						
Mean	0.86	0.80	0.64	0.85	0.84	0.78
Std. dev.	0.34	0.39	0.47	0.35	0.36	0.41
Total annual hours worked by all unmarried women						
Mean	1,678.98	1,436.42	1,074.85	1,687.26	1,562.50	1,339.28
Std. dev.	898.49	929.85	989.85	913.38	909.25	938.02
Annual hours worked by unmarried women who were already working						
Mean	1,946.35	1,783.49	1,659.79	1,979.98	1,859.41	1,717.99
Std. dev.	644.53	674.12	735.84	631.98	657.03	695.53
Preschool children						
Mean	0.00	0.24	0.69	0.00	0.23	0.58
Std. dev.	0.00	0.43	0.87	0.00	0.42	0.79
Non-white						
Mean	0.19	0.32	0.38	0.22	0.31	0.38
Std. dev.	39.00	0.46	0.48	0.41	0.46	0.48
Other income (1,000s)						
Mean	2.86	4.22	6.75	3.38	4.50	5.77
Std. dev.	8.04	7.08	9.70	9.59	9.64	9.68
Earned income (1,000s)						
Mean	26.29	19.58	13.67	28.16	22.45	17.55
Std. dev.	22.54	19.44	17.19	29.54	25.04	23.11
AFDC/TANF benefits (1,000s)						
Mean	0.44	0.71	1.05	0.41	0.66	0.96
Std. dev.	0.14	0.18	0.30	0.13	0.17	0.27
Child tax credit benefits (1,000s)						
Mean	0.00	0.00	0.00	0.00	0.15	0.21
Std. dev.	0.00	0.00	0.00	0.00	0.24	0.44
Observations	19,537.00	5,582.00	5,455.00	36,068.00	9,957.00	9,453.00

Note: The sample is unmarried women aged twenty-five to fifty-five years old. Preschool children include children aged younger than six years old in the family. Labor force participation equals one if annual hours of work are positive, zero otherwise. Earned income, other income, Aid to Families with Dependent Children (AFDC)/Temporary Assistance to Needy Families (TANF) benefits, and child tax credit figures are in 2005 dollars. Means are weighted with Current Population Survey (CPS) March supplement weights. Std. dev. = standard deviation. Source: Data from 1992-1994 and 1996-2001 March CPS.

and the NoChildren groups, be younger, be less likely to participate in the labor force, work fewer hours, have higher incomes from other sources, and have less earned income (conditional on working).[8]

Table 2 presents the labor force participation rates of unmarried women before and after 1994, as well as the changes categorized by levels of education and numbers of children.[9] Columns 1 and 2 show the average participation rates before and after 1994, and column 3 shows the difference between them. Negative values mean that they decreased their participation rate. In column 4, the DID estimates compare changes in labor force participation before and after 1994 between the treatment group and the comparison group. Panel I presents the participation rate categorized by the number of children and levels of education. Column 3 shows that after 1994, the TwoPlus group significantly increased its participation rate (13.4 percentage points) compared with the NoChildren and OneChild groups (-1.0 and 3.5 percentage points, respectively). As a result, the DID estimates in column 4 suggest that the TwoPlus group increased its labor force participation rate relative to the NoChildren and OneChild groups by 14.4 and 9.9 percentage points, respectively.

As discussed earlier, the EITC eligibility literature suggests that women with lower levels of education tend to be more likely to be eligible for the credit. Therefore, in panels II-IV, I also include those with two or more children who hold a college degree (the TwoPlus with college group) to compare the TwoPlus group with more educated women who have the same number of children. The DID estimates from panels II-IV suggest that the TwoPlus group increased its labor force participation relative to the other groups. For example, from panel II among high school dropouts, the participation rate of the TwoPlus group increased by 19.1 percentage points relative to the NoChildren group, 11.9 relative to the OneChild group, and 15.6 relative to the TwoPlus with college group.

The EITC expansion had the potential not only to affect the participation margin but also to affect the intensive margin of the labor supply of unmarried women. Table 3 presents total annual hours worked by all unmarried women (including those with zero hours of work). In all panels, column 3 shows that the TwoPlus group and the OneChild group statistically increased their annual hours worked after 1994 (with the exception of the OneChild group in panel IV). An increase in annual hours worked by the TwoPlus group ranges from 185 hours in the *some college* group to 319 hours in the *less than high school* group. Moreover, the DID estimates in column 4 suggest that the TwoPlus group significantly increased its total hours worked compared with the other groups. For example, in panel II, the

Table 2. Labor Force Participation Rates of Unmarried Women before and after 1994

		1	2	3	4
		Before 1994	After 1994	Difference	DID
Panel I: All					
Treatment group	TwoPlus	0.647 (.007)	0.781 (.005)	0.134^a (.009)	
Comparison group (A)	NoChildren	0.863 (.003)	0.852 (.002)	−0.010^a (.003)	0.144^a (.010)
Comparison group (B)	OneChild	0.805 (.006)	0.840 (.004)	0.035^a (.007)	0.099^a (.011)
Panel II: Less than high school					
Treatment group	TwoPlus	0.390 (.015)	0.578 (.012)	0.189^a (.020)	
Comparison group (A)	NoChildren	0.560 (.012)	0.557 (.009)	−0.002 (.014)	0.191^a (.024)
Comparison group (B)	OneChild	0.545 (.019)	0.615 (.014)	0.070^a (.024)	0.119^a (.030)
Comparison group (C)	TwoPlus with college	0.870 (.013)	0.900 (.008)	0.030^c (.016)	0.156^a (.025)
Panel III: High school					
Treatment group	TwoPlus	0.662 (.012)	0.795 (.008)	0.134^a (.014)	
Comparison group (A)	NoChildren	0.838 (.006)	0.817 (.004)	−0.021^a (.007)	0.155^a (.016)
Comparison group (B)	OneChild	0.820 (.009)	0.840 (.007)	0.020^c (.012)	0.113^b (.019)
Comparison group (C)	TwoPlus with college	0.870 (.013)	0.900 (.008)	0.030^c (.016)	0.104^c (.021)
Panel IV: Some college					
Treatment group	TwoPlus	0.774 (.014)	0.853 (.009)	0.080^a (.017)	
Comparison group (A)	NoChildren	0.900 (.005)	0.888 (.004)	−0.012^c (.007)	0.091^a (.018)
Comparison group (B)	OneChild	0.870 (.011)	0.880 (.007)	0.010 (.013)	0.070^a (.021)
Comparison group (C)	TwoPlus with college	0.870 (.013)	0.900 (.008)	0.030^c (.012)	0.049^b (.023)

Note: Mean values are reported, with standard errors in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. The sample consists of unmarried women between twenty-five and fifty-five years old. Means are weighted with Current Population Survey (CPS) March supplement weights. DID = difference-in-difference.
Source: Data from 1992-1994 and 1996-2001 March CPS.

Table 3. Total Annual Hours Worked by Unmarried Women before and after 1994 (Including Those with Zero Hour of Work)

		1 Before1994	2 After1994	3 Difference	4 DID
Panel I: All					
Treatment group	TwoPlus	1,074.850 (15.548)	1,339.433 (10.890)	264.583[a] (18.983)	
Comparison group (A)	NoChildren	1,678.986 (7.364)	1,687.261 (5.359)	8.274 (9.108)	256.307[a] (21.055)
Comparison group (B)	OneChild	1,436.422 (14.270)	1,562.500 (10.250)	126.077[a] (17.570)	138.505[a] (25.866)
Panel II: Less than high school					
Treatment group	TwoPlus	516.318 (24.416)	835.287 (22.641)	318.969[a] (33.298)	
Comparison group (A)	NoChildren	950.750 (24.778)	950.683 (17.882)	−0.066 (30.557)	319.036[a] (45.194)
Comparison group (B)	OneChild	812.553 (35.373)	963.238 (28.531)	150.684[a] (45.445)	168.285[a] (56.339)
Comparison group (C)	TwoPlus with college	1,637.868 (33.962)	1,720.730 (21.200)	82.862[b] (40.036)	236.107[a] (52.074)
Panel III: High school					
Treatment group	TwoPlus	1,085.679 (24.704)	1,336.759 (17.568)	251.079[a] (30.314)	
Comparison group (A)	NoChildren	1,588.438 (13.533)	1,573.839 (10.195)	−14.598 (16.643)	265.678[a] (34.727)
Comparison group (B)	OneChild	1,456.823 (22.680)	1,556.664 (17.102)	99.841[a] (28.405)	151.238[a] (41.542)
Comparison group (C)	TwoPlus with college	1,637.868 (33.962)	1,720.730 (21.200)	82.862[b] (40.036)	168.217[a] (50.218)
Panel IV: Some college					
Treatment group	TwoPlus	1,318.299 (33.493)	1,503.514 (22.329)	185.215[a] (40.254)	
Comparison group (A)	NoChildren	1,734.778 (15.274)	1,736.578 (11.293)	1.800 (18.996)	183.414[a] (44.511)
Comparison group (B)	OneChild	1,593.677 (27.466)	1,629.588 (19.994)	35.911 (33.973)	149.303[a] (52.764)
Comparison group (C)	TwoPlus with college	1,637.868 (33.962)	1,720.730 (21.200)	82.862[b] (40.036)	102.352[c] (56.774)

Note: Mean values are reported, with standard errors in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. The sample consists of unmarried women between twenty-five and fifty-five years old. Means are weighted with Current Population Survey (CPS) March supplement weights. DID = difference-in-difference.
Source: Data from 1992-1994 and 1996-2001 March CPS.

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TwoPlus group increased its total hours worked by 319 compared with the NoChildren group, 168 compared with the OneChild group, and 236 compared with the TwoPlus with college group.

Because most EITC recipients are in the plateau or phase-out ranges, in theory, the EITC expansion is predicted to reduce hours worked by unmarried women who were already in the labor force (Meyer 2000). Thus, in table 4, I restrict the sample to include only those with annual hours of work exceeding zero. Column 3 in all panels shows that annual hours worked by current unmarried female workers increased after 1994. However, the DID estimates in column 4 suggest that the TwoPlus group did not statistically significantly reduce its hours worked compared with the NoChildren, the OneChild, and the TwoPlus with college groups (except in panel II, compared with the NoChildren group).

5. Regression Specification and Results

5.1. Regression Specification

In tables 2 and 3, the DID estimates show that the increases in the participation rates and total annual hours of work of the TwoPlus group are greater than those of the NoChildren and the OneChild groups for all cases. This suggests that a substantial increase in the EITC benefits for the TwoPlus group may be able to explain that groups increase in labor supply after 1994 relative to the NoChildren and the OneChild groups. However, these groups are not observationally the same. For example, the TwoPlus group tends to attain lower education, as shown in table 1. In addition, major policy changes, such as welfare reform, may have had differential effects on these groups. To account for other characteristics and policy changes that could result in differential labor supply outcomes, I use a probit model to analyze changes in the extensive margin and an ordinary least squares (OLS) estimation and a tobit model to analyze changes in the intensive margin of labor supply.

In the regression format, I include a dummy variable for having one child (OneChild$_{it}$) and a dummy variable for having two or more children (TwoPlus$_{it}$) in the model. The inclusion of these two variables implies that the NoChildren group is the base group. I also control for other factors that may differentially affect the labor supply of unmarried women, including demographic and area characteristics and other government programs. I estimate the following probit model:

Table 4. Annual Hours Worked by Unmarried Women before and after 1994 (Conditional on Hours of Work Exceeding Zero)

		1 Before1994	2 After1994	3 Difference	4 DID
Panel I: All					
Treatment group	TwoPlus	1,659.791 (14.310)	1,713.995 (9.226)	54.204[a] (17.026)	
Comparison group (A)	NoChildren	1,946.358 (5.683)	1,979.985 (4.052)	33.627[a] (6.980)	20.577 (18.401)
Comparison group (B)	OneChild	1,783.496 (11.689)	1,859.418 (8.088)	75.922[a] (14.215)	−21.718 (22.180)
Panel II: Less than high school					
Treatment group	TwoPlus	1,325.558 (39.205)	1,444.87 (24.806)	119.312[a] (46.394)	
Comparison group (A)	NoChildren	1,699.407 (25.907)	1,705.399 (17.547)	5.992 (31.288)	113.320[b] (55.959)
Comparison group (B)	OneChild	1,490.932 (39.596)	1,567.064 (29.032)	76.132 (49.099)	43.180 (67.551)
Comparison group (C)	TwoPlus with college	1,882.170 (25.888)	1,911.482 (16.582)	29.313 (30.744)	90.000 (55.656)
Panel III: High school					
Treatment group	TwoPlus	1,641.080 (22.491)	1,680.774 (14.946)	39.695 (27.004)	
Comparison group (A)	NoChildren	1,895.978 (9.933)	1,926.754 (7.353)	30.776[b] (12.358)	8.919 (29.698)
Comparison group (B)	OneChild	1,776.771 (18.924)	1,852.299 (13.524)	75.528[a] (23.260)	−35.833 (35.640)
Comparison group (C)	TwoPlus with college	1,882.170 (25.888)	1,911.482 (16.582)	29.313 (30.744)	10.382 (40.919)
Panel IV: Some college					
Treatment group	TwoPlus	1,703.499 (28.698)	1,761.875 (18.859)	58.376[c] (34.340)	
Comparison group (A)	NoChildren	1,928.185 (12.158)	1,955.591 (8.722)	27.405[c] (14.963)	30.970 (37.458)
Comparison group (B)	OneChild	1,832.234 (21.807)	1,852.707 (16.217)	20.473 (27.176)	37.902 (43.792)
Comparison group (C)	TwoPlus with college	1,882.170 (25.888)	1,911.482 (16.582)	29.313 (30.744)	29.063 (46.091)

Note: Mean values are reported, with standard errors in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. The sample consists of unmarried women between twenty-five and fifty-five years old, who have annual hours worked exceeding zero. Means are weighted with Current Population Survey (CPS) March supplement weights. DID = difference-in-difference.
Source: Data from 1992–1994 and 1996–2001 March CPS.

25

$$
\begin{aligned}
P(\text{lfp}_{it} = 1) = {} & \alpha + \beta_1 \text{OneChild}_{it} + \beta_2 \text{TwoPlus}_{it} + \beta_3 \text{After1994}_t \\
& + \beta_4 \text{After1994}_t \times \text{OneChild}_{it} + \beta_5 \text{After1994}_t \times \text{TwoPlus}_{it} \\
& + \beta_6 \text{Waiver}_{st} + \beta_7 \text{TANF}_{st} + \beta_8 \text{MaxBenefit}_{st} \\
& + \beta_9 \text{ChildTaxCredit}_t + \beta_{10} \text{Unempr}_{st} + \beta_t \text{Year}_t \\
& + \beta_s \text{State}_s + \beta_k X_{it} + \varepsilon_{it},
\end{aligned}
$$

where i indexes individuals, s indexes states, and t indexes years. lfp_{it} is a dummy variable that equals 1 if a woman reported working at least one hour and equals zero otherwise. X_{it} is a set of demographic characteristic variables. After1994_t equals 1 for years after 1994 and equals 0 otherwise.

The coefficient of interest, β_5, measures the change in the probability of participating in the labor force of the TwoPlus group relative to the change in the NoChildren group, all else being equal. β_4 measures the change in the OneChild group relative to the change in the NoChildren group, all else being equal. Theoretically, I expect β_4 and β_5 to be positive, which would imply that the TwoPlus group and the OneChild group increased their probability of participating in the labor force after 1994, relative to the NoChildren group. In addition, to measure the difference between the effect of the expansion on the probabilities of labor force participation of the TwoPlus group and the OneChild group, I also estimate the same probit model with the OneChild group as the base group.[10]

Aside from the EITC expansion in 1993, the major welfare reform in 1996, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), may have increased the labor supply of low-income unmarried women during the 1990s.[11] Officially, AFDC became TANF, and the major provisions included the devolution of greater program authority to the state, ongoing work requirements, and a five-year maximum time limit (Blank 2002). Welfare reform effects are captured by Waiver_{it}, a dummy variable that equals one for all years after the state started adopting a waiver to reform AFDC and zero otherwise. TANF_{it} is also a dummy variable, equaling one for all years when the state had TANF in place and zero otherwise. MaxBenefit_{skt}, a sum of maximum benefits from AFDC/TANF and food stamp programs (in 1,000s of 2005 dollars), is included as a proxy for the option for unmarried women when they were not working.[12] Using the National Bureau of Economic Research's TAXSIM9 model (Feenberg and Coutts 1993), I calculate the child tax credit, which is another tax policy started in tax year 1998, which might affect the labor supply of women. Thus, ChildTaxCredit_t is included in the specification.

To account for area characteristics, I include Unempr_{st}, the unemployment rate of the metropolitan areas, and for unmarried women outside of metropolitan areas, I use the unemployment rates at the state level.[13] In addition, to reflect the fact that the population may have different distributions in different time periods, I include Year_t, a set of year dummies.[14] To control for unobservable effects that are fixed over time within each state, I include State_s, a set of dummy variables for states.

Following Eissa and Liebman (1996), demographic characteristics include the number of never-married children between ages one and eighteen, the number of children in the family younger than age six, and race.[15] In addition, other income[16] (in 1,000s of 2005 dollars), dummy variables for women's ages, and dummy variables for levels of education are included.[17] Because the EITC benefits substantially vary by state and the number of children, standard errors are clustered by state and number of children.

5.2. Results

Table 5 presents the marginal effects of the probit model estimating the labor force participation of unmarried women between 1991 and 2000.[18] Column 1 presents results from my baseline specification. Panel I reports the marginal effects when the NoChildren group is the base group. The marginal effect of $\text{After1994}_t \times \text{TwoPlus}_{it}$ (0.050) is positive and statistically significant at the 1 percent level ($SE = .004$), suggesting that the 1993 EITC expansion increased the probability of participating in the labor force of the TwoPlus group by 5.0 percentage points, compared with the NoChildren group. This estimate is consistent with the findings of Ellwood (2000) and Grogger (2003), who also examine the effect of EITC using the same sample period and find that the EITC has substantial effects on the employment of single mothers.

Demographic characteristic variables have the expected signs. All else being equal, relative to childless women, women with children have a lower probability of participating in the labor force, especially women with preschool children. Non-white unmarried women have a lower probability of participating in the labor force than white women. All else being equal, older unmarried women have a lower participation rate. The level of education has a positive effect on the participation rate. Finally, an increase in other incomes also lowers the participation rate. For the effect of welfare programs, the marginal effects of the MaxBenefit ($-.057$) and ChildTaxCredit (0.063) are statistically significant at the 1 percent level, indicating that a \$1,000 increase in the maximum benefits, all else being equal, would

Table 5. Marginal Effects of Probit Model

Dependent variable: Labor force participation		
	Baseline	With children versus without children
	1	2
Panel I: Relative to the NoChildren group		
OneChild	−0.014 (.007)[b]	OneChild −0.008 (.007)
TwoPlus	−0.025 (.010)[a]	
After1994	−0.022 (.010)[b]	After1994 −0.022 (.010)[b]
After1994 × OneChild	−0.005 (.008)	After1994 × WithChildren 0.021 (.009)[b]
After1994 × TwoPlus	0.050 (.010)[a]	
Unemployment rate	−0.005 (.001)[a]	Unemployment rate −0.005 (.001)[a]
Other income (1,000s)	−0.006 (.001)[a]	Other income (1,000s) −0.006 (.000)[a]
Number of children younger than 18	−0.010 (.005)[a]	Number of children younger than 18 −0.009 (.004)[a]
Number of preschool children	−0.051 (.004)[a]	Number of preschool children −0.051 (.004)[a]
Non-white	−0.058 (.005)[a]	Non-white −0.058 (.005)[a]
Aged 31-35	0.001 (.004)	Aged 31–35 0.001 (.004)
Aged 36-40	0.001 (.005)	Aged 36–40 0.001 (.005)
Aged 41-45	−0.005 (.004)	Aged 41–45 −0.006 (.004)
Aged 46-50	−0.014 (.004)[a]	Aged 46–50 −0.014 (.005)[a]
Aged 51-55	−0.035 (.006)[a]	Aged 51–55 −0.035 (.006)[a]
High school	0.114 (.004)[a]	High school 0.114 (.004)[a]
Some college	0.133 (.004)[a]	Some college 0.134 (.004)[a]
College	0.206 (.005)[a]	College 0.207 (.005)[a]
TANF	−0.013 (.011)	TANF −0.013 (.010)
Waiver	−0.005 (.005)	Waiver −0.006 (.005)
AFDC/TANF benefits (1,000s)	−0.057 (.019)[a]	AFDC/TANF benefits (1,000s) −0.080 (.020)[a]
Child tax credit (1,000s)	0.063 (.011)[a]	Child tax credit (1,000s) 0.062 (.011)[a]
Panel II: Relative to the OneChild group		
After1994 × NoChildren	0.007 (.008)	
After1994 × TwoPlus	0.043 (.012)[a]	

Note: Sample size is 86,044. In addition to the variables shown, all regressions include year and state dummies. Robust standard errors (clustered by state and number of children) are in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. Regressions are weighted with March Current Population Survey (CPS) weights. AFDC = Aid to Families with Dependent Children; TANF = Temporary Assistance to Needy Families.

reduce the participation rate of those women by 5.7 percentage points. However, a $1,000 increase in the child tax credit would increase the participation rate by 6.3 percentage points. The AFDC waivers and the TANF implementation do not have a significant effect on labor force participation. However, in table 6, when I estimate the same probit model by education level, the estimates of these two variables from the less than high school group (column 1) are positive and statistically significant at the 5 percent level. They indicate that, on average, women increased their participation rate by 2.7 and 3.5 percentage points after their state implemented TANF and the AFDC waiver, respectively.

The marginal effect on $After1994_t \times OneChild_{it}$ is not statistically significant. This suggests that the probability of the OneChild group participating in the labor force is not statistically different from that of the NoChildren group.

In panel II, I also estimate the same probit model as in panel I but use the OneChild group as the base group. Panel II reports only the marginal effects of coefficients of interest. The marginal effects on $After1994_t \times TwoPlus_{it}$ (0.043) is positive and statistically significant at the 1 percent level ($SE = 0.012$), indicating that the EITC expansion also increased the probability of participating in the labor force of the TwoPlus group by 4.3 percentage points, relative to the OneChild group.

To check the robustness of my result, in column 2, I duplicate Eissa and Liebman (1996) by separating unmarried women into two groups: those with children and those with no children. The marginal effect of $After1994 \times WithChildren$ (0.021 and $SE = 0.009$) indicates that the 1993 EITC expansion increased the participation rate of unmarried women with children by 2.1 percentage points relative to those with no children. Using the smaller EITC expansion in 1986, Eissa and Liebman (1996) find a 2.8 percentage point increase. One possible explanation is that the 1993 EITC expansion did not have a statistically significant effect on the OneChild group's participation rate. As a result, when my sample is categorized by women with and without children, the EITC effect on the TwoPlus group is diluted.

As discussed earlier, women with lower education levels are more likely to be eligible for the EITC. Therefore, I expect that high school dropouts and high school graduates will have a larger participation response than those with higher education. To test this hypothesis, I estimate probit models of labor participation by levels of education with the same specification as in column 1 in table 5 but excluding dummies for levels of education.

Table 6 reports the marginal effects of probit models by levels of education. In panel I, columns 1 and 2, the marginal effects of $After1994 \times$

Table 6. Marginal Effects of Probit Model by Levels of Education

	Dependent variable: Labor force participation			
	Less than high school	High school	Some college	College
	1	2	3	4
Panel I: Relative to the NoChildren group				
OneChild	0.060 (.025)[b]	0.036 (.011)[a]	0.019 (.014)	−0.010 (.011)
TwoPlus	0.010 (.040)	0.010 (.016)	0.022 (.020)	−0.001 (.018)
After1994	−0.001 (.030)	−0.016 (.011)	0.003 (.011)	−0.030 (.009)[a]
After1994 × OneChild	−0.010 (.024)	−0.022 (.014)[c]	−0.024 (.019)	−0.009 (.012)
After1994 × TwoPlus	0.108 (.028)[a]	0.061 (.014)[a]	0.018 (.014)	0.006 (.012)
Unemployment rate	−0.004 (.003)	−0.005 (.002)a	−0.006 (.002)[a]	−0.004 (.001)[a]
Other income (1,000s)	−0.049 (.005)[a]	−0.010 (.001)[a]	−0.005 (.001)[a]	−0.002 (.001)[a]
Number of children younger than 18	−0.049 (.021)[b]	−0.002 (.008)	−0.010 (.009)	−0.017 (.009)
Number of preschool children	−0.115 (.013)[a]	−0.048 (.007)[a]	−0.047 (.007)[a]	−0.027 (.005)[a]
Non-white	−0.068 (.013)[a]	−0.069 (.009)[a]	−0.045 (.008)[a]	−0.038 (.006)[a]
Aged 31-35	−0.002 (.018)	0.001 (.007)	−0.007 (.009)	0.012 (.005)[b]
Aged 36-40	0.024 (.019)	0.007 (.008)	−0.009 (.001)	0.005 (.004)
Aged 41-45	−0.001 (.024)	0.008 (.007)	−0.001 (.009)	−0.004 (.005)
Aged 46-50	0.008 (.021)	0.000 (.008)	−0.013 (.010)	−0.013 (.005)[a]
Aged 51-55	−0.017 (.022)	−0.019 (.010)[c]	−0.035 (.012)[a]	−0.032 (.007)[a]
TANF	0.027 (.014)[b]	0.009 (.016)	0.003 (.026)	0.001 (.011)
Waiver	0.035 (.017)[b]	0.001 (.007)	0.013 (.008)	0.008 (.006)
AFDC/TANF benefits (1,000s)	−0.082 (.040)[b]	−0.034 (.016)[a]	−0.061 (.036)	0.006 (.015)
Child tax credit (1,000s)	0.072 (.029)[a]	0.063 (.025)[a]	0.043 (.016)[a]	0.022 (.012)[c]
Observations	12,421	27,137	17,507	28,979
Panel II: Relative to the OneChild group				
After1994 × NoChildren	0.008 (.024)	0.023 (.014)	0.024 (.020)	0.010 (.012)
After1994 × TwoPlus	0.097 (.029)[a]	0.052 (.018)[a]	0.014 (.012)	0.004 (.013)

Note: In addition to the variables shown, all regressions include year and state dummies. Robust standard errors (clustered by state and number of children) are in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. Regressions are weighted with March Current Population Survey (CPS) weights. AFDC = Aid to Families with Dependent Children; TANF = Temporary Assistance to Needy Families.

TwoPlus are positive and statistically significant at the 1 percent level. They indicate that the EITC expansion results in an increase in the participation rate of those in the TwoPlus group who are high school dropouts and high school graduates by 10.8 and 6.1 percentage points, respectively, relative to the NoChildren group. However, I do not find any statistically significant change in the labor force participation among college dropouts and college graduates. This might be because women with a college education already had a high participation rate.

Consistent with results in panel I, in panel II of table 6, only the marginal effects on After1994 × TwoPlus in columns 1 and 2 are statistically significant. The marginal effects suggest that relative to the OneChild group, those in the TwoPlus group who are high school dropouts and high school graduates increased their participation rate by 9.7 and 5.2 percentage points, respectively.

Results in the previous section show that the EITC expansion in 1993 increases the labor force participation of unmarried women. Regarding the hours of work, previous studies find that the EITC expansion has a small negative effect on hours worked by women who were already in the labor force (Hotz and Scholz 2003). This suggests that the EITC could result in an increase or decrease in total hours of work, depending on how many hours those new workers would work. The total of annual hours takes the value of zero for a nontrivial fraction and continuously distributes over positive values. As a result, OLS provides inconsistent estimators (Wooldridge 2002). Thus, I use a tobit model to estimate the total number of hours worked. To investigate how the 1993 EITC expansion affects hours worked by those who are already in the labor force, I also use OLS to estimate their hours worked.[19] The following is the empirical model:

$$
\begin{aligned}
\text{Annual Hours}_{it} = {} & \gamma + \delta_1 \text{OneChild}_{it} + \delta_2 \text{TwoPlus}_{it} + \delta_3 \text{After1994}_t \\
& + \delta_4 \text{After1994}_t \times \text{OneChild}_{it} + \delta_5 \text{After1994}_t \\
& \times \text{TwoPlus}_{it} + \delta_6 \text{Waiver}_{it} + \delta_7 \text{TANF}_{it} + \delta_8 \text{MaxBenefit}_{st} \\
& + \delta_9 \text{ChildTaxCredit}_t + \delta_{10} \text{Unempr}_{st} \\
& + \delta_s \text{State}_s + \delta_t \text{Year}_t + \delta_k X_{it} + \theta_{it},
\end{aligned}
$$

where Annual Hours$_{it}$ is the total number of annual hours worked by unmarried women.

Before examining the total hours of work, I will discuss the effect of the 1993 EITC expansion on the number of hours worked by currently

unmarried female workers. Table 7 presents the results of the OLS estimation of annual hours worked by women who were already in the labor force.[20] Consistent with Eissa and Liebman (1996), in column 1, the coefficient of interest on After1994$_t$ × TwoPlus is negative but not statistically significant (coefficient = −51.97, SE = 30.26). The coefficients of interest in columns 2-5, when I estimate the same model by education level, also show consistent results. This suggests that among women who were already in the labor force, the TwoPlus group did not reduce its hours worked relative to the NoChildren group.

To return to the effect of the 1993 EITC expansion on the total hours of work, table 8 presents the marginal effects from a tobit model on the total hours worked.[21] The first column shows that the EITC expansion increased the TwoPlus group's total hours of work by 97.9 hours (SE = 19.74) at statistically significant levels. Columns 2-5 show results of the tobit models by education level. Consistent with the results from the participation margin, the marginal effects of interest on After1994$_t$ × TwoPlus$_{it}$ in columns 2 and 5 suggest that, due to the EITC expansion, among women with less than high school and with high school education, the TwoPlus group increased their total hours of work by 250.18 and 105.15 hours, respectively, relative to the NoChildren group. However, I do not find any statistically significant change in total hours worked among those with some college education or those with a college degree. Results in table 8 suggest that the 1993 EITC expansion has a positive effect on total hours of work, especially among less-educated women, who are the EITC target population.

In panel II, the marginal effects in column 1 show the EITC expansion results in an 81.08-hour increase in total hours worked by the TwoPlus group relative to the OneChild group. These increases in total hours of work are mostly from women with a lower level of education.

For comparison, I also report OLS estimates of After1994$_t$ × TwoPlus in panel III. In general, the tobit estimates are larger (more positive) than those from OLS. This suggests that OLS estimates might be biased toward zero.

Back to results from panel I, the estimates of demographic characteristic variables have expected signs. All else being equal, women with children worked fewer hours than those with no children. Non-white women worked fewer hours than white women. Women who are older or have higher education worked a greater number of hours. The waivers and TANF implementation have no statistically significant effect on total hours worked. However, an increase in the AFDC/TANF benefits has a negative and statistically significant effect. A $1,000 increase in the benefits would reduce total hours worked by 219.98 hours. These reduced hours are heavily

Table 7. Results of Ordinary Least Squares (OLS) Estimation

	Dependent variable: Annual hours of work (positive hours only)				
	All	Less than high school	High school	Some college	College
	1	2	3	4	5
OneChild	−56.023 (18.408)[a]	−150.145 (46.732)[a]	−20.628 (27.028)	−15.056 (40.082)	−97.328 (28.899)[a]
TwoPlus	−65.641 (37.092)[c]	−233.891 (82.944)[a]	−27.127 (57.818)	−47.845 (60.870)	−15.143 (59.993)
After1994	42.643 (12.976)[a]	−4.119 (45.623)	19.994 (53.325)	39.693 (27.493)	−13.215 (36.377)
After1994 × OneChild	−40.832 (24.822)	−9.581 (55.505)	−48.892 (37.999)	−88.43 (56.439)	16.7 (26.575)
After1994 × TwoPlus	−51.968 (30.262)	−55.334 (54.212)	−40.639 (31.560)	−49.122 (39.391)	−27.167 (40.296)
Unemployment rate	−12.592 (2.741)[a]	−19.218 (6.483)[a]	−8.875 (4.129)[b]	−10.598 (5.175)[b]	−13.978 (3.091)[a]
Other income (1,000s)	−10.677 (.799)[a]	−42.62 (5.828)[a]	−13.404 (2.732)[a]	−14.671 (1.698)[a]	−7.402 (.766)[a]
Number of children younger than 18	−45.181 (15.519)[a]	−37.22 (30.815)	−52.916 (23.388)[b]	−37.563 (29.569)	−41.593 (24.243)[c]
Number of preschool children	−85.381 (9.806)[a]	−76.698 (21.313)[a]	−95.292 (13.333)[a]	−94.879 (20.127)[a]	−66.584 (19.823)[a]
Non-white	−61.309 (9.011)[a]	−46.943 (24.993)[c]	−73.186 (17.186)[a]	−54.963 (13.147)[a]	−54.783 (13.710)[a]
Aged 31-35	89.481 (8.320)[a]	104.514 (35.261)[a]	54.794 (16.265)[a]	88.444 (18.947)[a]	113.621 (10.379)[a]
Aged 36-40	124.116 (9.848)[a]	184.299 (35.364)[a]	97.381 (19.539)[a]	145.737 (18.527)[a]	118.276 (14.304)[a]
Aged 41-45	129.191 (9.818)[a]	222.931 (39.118)[a]	120.217 (21.745)[a]	157.11 (18.411)[a]	104.626 (12.931)[a]
Aged 46-50	133.059 (10.434)[a]	215.722 (41.579)[a]	129.918 (20.424)[a]	165.591 (20.351)[a]	106.314 (16.808)[a]
Aged 51-55	123.89 (12.802)[a]	229.473 (52.278)[a]	122.422 (27.690)[a]	147.844 (21.064)[a]	84.567 (17.535)[a]
High school	223.847 (11.695)[a]				
Some college	268.874 (12.014)[a]				
College	382.532 (10.316)[a]				
TANF	−22.489 (24.998)	−67.583 (85.772)	−38.188 (47.738)	−94.169 (52.780)	37.335 (29.264)
Waiver	7.011 (10.783)	50.63 (38.054)	2.408 (16.304)	6.256 (17.816)	4.911 (14.865)
AFDC/TANF benefits (1,000s)	−28.581 (32.116)	−67.887 (56.168)	−29.86 (47.647)	−7.53 (64.815)	−14.894 (40.122)
Child tax credit (1,000s)	44.127 (20.933)[a]	78.614 (31.694)[a]	51.532 (24.856)[a]	46.749 (18.996)[a]	23.344 (12.167)[c]
Observations	71,095	6,848	21,959	15,281	27,007

Note: In addition to the variables shown, all regressions include year and state dummies. Robust standard errors (clustered by state and number of children) are in parentheses. a, b, and c are statistically significant at 1, 5, and 10 percent levels, respectively. Regressions are weighted with March Current Population Survey (CPS) weights. AFDC = Aid to Families with Dependent Children; TANF = Temporary Assistance to Needy Families.

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Table 8. Marginal Effects of Tobit Model

	Dependent variable: Annual hours worked (all observations)				
	All	Less than high school	High school	Some college	College
	1	2	3	4	5
Panel I: Relative to the NoChildren group					
OneChild	39.495 (18.633)[b]	36.675 (41.889)	116.436 (31.833)[a]	87.434 (39.606)[b]	−69.302 (38.564)[c]
TwoPlus	−22.097 (29.628)	−86.251 (56.729)	32.169 (50.748)	83.167 (64.501)	72.885 (68.508)
After 1994	−28.443 (30.041)	9.719 (40.607)	−12.229 (28.708)	40.687 (34.049)	−95.377 (43.898)[b]
After 1994 × OneChild	−22.928 (18.598)	40.718 (46.08)	−44.151 (32.06)	−67.918 (37.675)	23.688 (32.679)
After 1994 × TwoPlus	97.864 (19.739)[a]	250.179 (42.659)[a]	105.149 (33.455)[a]	−16.136 (41.896)	−14.256 (39.513)
Unemployment rate	−24.09 (2.379)[a]	−15.885 (4.720)[a]	−21.5 (4.653)[a]	−25.075 (4.911)[a]	−25.543 (3.936)[a]
Other income (1,000s)	−28.391 (.455)[a]	−99.366 (2.379)[a]	−47.749 (1.124)[a]	−31.751 (1.020)[a]	−15.561 (.517)[a]
Number of children younger than 18	−52.152 (13.233)[a]	−69.466 (26.800)[a]	−58.623 (22.847)[b]	−86.255 (29.319)[a]	−126.222 (29.874)[a]
Number of preschool children	−214.034 (9.317)[a]	−209.194 (18.700)[a]	−216.881 (15.909)[a]	−210.465 (19.175)[a]	−159.417 (18.889)[a]
Non-white	−172.454 (7.696)[a]	−80.655 (18.870)[a]	−216.558 (13.916)[a]	−153.174 (16.046)[a]	−144.118 (12.316)[a]
Aged 31-35	77.542 (9.953)[a]	34.825 (26.745)	48.869 (18.689)[a]	59.806 (20.955)[a]	137.141 (14.629)[a]
Aged 36-40	108.398 (10.179)[a]	112.179 (27.399)[a]	92.691 (19.014)[a]	109.386 (21.275)[a]	129.072 (15.143)[a]
Aged 41-45	101.169 (10.429)[a]	98.046 (28.956)[a]	116.287 (19.400)[a]	135.842 (21.944)[a]	93.545 (15.511)[a]
Aged 46-50	86.415 (10.906)[a]	101.829 (29.385)[a]	107.944 (20.703)[a]	120.512 (23.227)[a]	72.815 (15.919)[a]
Aged 51-55	26.512 (11.725)[b]	66.466 (29.081)[b]	49.042 (21.541)[b]	55.408 (25.486)[b]	0.019 (18.174)
High school	678.605 (10.820)[a]	—	—	—	—
Some college	864.453 (11.642)[a]	—	—	—	—
College	1,066.597 (10.966)[a]	—	—	—	—

TANF	46.304 (25.179)	87.292 (64.158)	15.755 (49.684)	26.32 (52.352)	12.136 (36.465)
Waiver	−9.85 (10.247)	−35.309 (26.651)	−1.485 (18.983)	−27.13 (21.297)	26.582 (15.41)
AFDC/TANF benefits (1,000s)	−219.975 (44.787)[a]	−281.053 (108.872)[a]	−230.634 (80.970)[a]	−172.202 (95.001)	16.922 (72.434)
Child tax credit (1,000s)	139.103 (19.178)[a]	332.605 (64.958)[a]	277.284 (35.155)[a]	184.98 (37.030)[a]	72.097 (30.367)[a]
Observations	86,044	12,421	27,137	17,507	28,979
Left-censored (annual hour = 0)	14,949	5,573	5,178	2,226	1,972
Panel II: Relative to the OneChild group					
After1994 × NoChildren	22.96 (18.598)	−40.075 (46.080)	44.318 (32.060)	98.336 (67.675)	−23.681 (32.679)
After1994 × TwoPlus	81.075 (23.555)[a]	205.883 (51.510)[a]	90.118 (39.109)[a]	73.373 (48.139)	−67.834 (46.557)
Panel III: Results of OLS estimation					
After1994 × TwoPlus	54.373 (25.277)[a]	160.945 (47.213)[a]	80.314 (38.568)[a]	−44.533 (45.996)	−83.115 (51.085)

Note: In addition to the variables shown, all regressions include year and state dummies. Robust standard errors (clustered by state and number of children) are in parentheses. a, b, and c are statistically significant at the 1, 5, and 10 percent levels, respectively. Regressions are weighted with March Current Population Survey (CPS) weights. AFDC = Aid to Families with Dependent Children; TANF = Temporary Assistance to Needy Families.

concentrated among women with a lower level of education. Finally, the child tax credit has a significantly positive effect on total hours worked by all women.

6. Conclusion

In 1996, the 1993 EITC expansion was fully phased in, when major welfare reforms were implemented. In this study, I use a differential increase in the EITC benefits under the expansion in 1993 to identify the effect of the EITC expansion in 1993 on both margins of the labor supply of unmarried women, accounting for the effect of welfare reform. Using March CPS data, my findings on the effect of EITC on the participation margin are consistent with those of previous work. Unmarried women with two or more children increased their participation rate by 4.3 percentage points relative to those with one child (from a base of 78 percent). Assuming that an unmarried woman had income falling in the flat range before the EITC expansion in 1993, an increase in the maximum value of the credit causes unmarried women with two or more children to have $906 more than those with one child. Their average income is $15,209. From a rough calculation, the upper bound of the elasticity of labor force participation with respect to earned income for unmarried women is 0.92. The elasticity of labor force participation is larger for those who did not have a college degree (1.06 for the *less than high school* group and 0.95 for the *high school* group).[22]

The 1993 EITC expansion also favors a family with one child relative to one with no children. From 1993 to 1996, the subsidy rate of a family with one child increased by 15.5 percentage points (18.5 to 34 percent). In addition, the maximum credit available to the OneChild group increased by $741. However, this study finds no evidence of a statistically significant increase in the labor force participation of this group. This might be because an increase in the EITC benefits for this group might not provide enough of an incentive for them.

For the effect of the EITC expansion on hours worked by current workers, I find a slightly negative effect, but these estimates are not statistically significant at standard levels. Another focus of this study is to examine the net effect of the EITC on total hours worked by all unmarried women. Following the same method, I find that the upper bound of the elasticity of total annual hours of work with respect to earned income is 0.98. As with the participation margin, when categorized by education levels, the elasticity of total hours of work is larger in the lower education groups (1.53 for the *less than high school* group, 0.94 for the *high school* group). Findings from this study confirm that the EITC has a positive effect on total hours worked.

Notes

1. See Hotz and Scholz (2003) for a summary of the labor supply response to the EITC.
2. See, for example, Schoeni and Blank (2000), Grogger (2003), and Kaestner and Kaushal (2005).
3. An ''advance payment'' option was added in 1978, so that workers would be able, if they so chose, to receive the credit incrementally throughout the year. Only 1.1 percent of EITC recipients with children used the advance payment option in 1998 (Hotz and Scholz 2003).
4. The direction of the labor supply incentive depends only on which income range she is in before the expansion. What happens after the expansion is the result of her choice. Thanks are due to an anonymous referee for pointing out this fact.
5. The NoChildren and the OneChild groups (the comparison groups) are also affected by the EITC expansion, and in theory, they are expected to move in the same direction as the TwoPlus group (the treatment group). Therefore, the effect of the EITC on the labor supply in this study might be underestimated. To mitigate this potential problem, I include a variety of treatment and comparison groups.
6. OBRA-93 became effective in January 1994; thus, I drop the 1995 CPS data to allow one year for those women to adjust their labor supply response.
7. Those who claim head of household filling status are those who are unmarried and pay more than 50 percent of the costs of keeping up a home for themselves and their dependents or other qualifying individuals (Form W-4, Internal Revenue Service).
8. All descriptive differences are statistically significant at standard levels.
9. For the definition of labor force participation, I follow Eissa and Liebman (1996), who define labor force participation as working at least one hour during the year. As a definition check, I also use other positive numbers and find consistent results.
10. Because of the nonlinearity of probit model, I cannot use $\beta_5 - \beta_4$ to measure the difference.
11. The major provisions of PRWORA included the devolution of greater program authority to the state, an ongoing work requirement, and a five-year maximum time limit (Blank 2002).
12. I would like to thank Dan Rosenbaum, who kindly provided the data on the maximum benefits from 1991 to 1997. Data from 1998 to 2000 are from the 1998 and 2000 Green Books and the Welfare Rules Database from the Urban Institute.
13. Data for the unemployment rate are from the Local Area Unemployment Statistics, Bureau of Labor Statistics. The ideal unemployment data would be the unemployment rate of women alone, but the Local Area Unemployment

Statistics program does not report the female unemployment rate separately at the metropolitan level.

14. Wooldridge (2006) suggests that in the case of pooling independent cross-sections across time such as for CPS data, we should allow the intercept to differ across periods by including dummy variables for all except the base year (1991 is the omitted year in this regression).

15. Previous studies suggest that women with preschool children had a significantly lower probability of working.

16. Other income includes income from unearned sources but excludes income from transfer programs.

17. I include three dummy variables for education levels, which represent high school, some college, and college (less than high school is the omitted category) and five dummy variables for ages, which represent the ages of 31-35, 36-40, 41-45, 46-50, and 51-55 (25-30 is the omitted category).

18. The marginal effects of the interaction terms are calculated as the cross-partial derivatives, following Ai and Norton (2003). The marginal effects of other dummies are calculated as $E[y|x, x_i = 1] - E[y|x, x_i = 0]$.

19. When using only hours worked by those who are already in the labor force (conditional on annual hours of work exceeding zero), OLS and a tobit model provide the same result.

20. The number of observations decreases by 14,950 to 71,102 observations.

21. Following Wooldridge (2002), the marginal effects from tobit models are calculated as $E[y|x, x_i = 1] - E[y|x, x_i = 0]$.

22. Hotz and Scholz (2003) estimate the elasticity of labor force participation based on previous studies. The range is between 0.69 and 1.16. Focusing on single parents in the welfare program between 1991 and 2000, Hotz, Mullin, and Scholz (2006) find that their employment elasticity with respect to disposable income is 1.3.

Author's Note

The content, including all errors, is solely the responsibility of the author.

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