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Taxes and the labor market participation of married couples: the earned income tax credit

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Abstract

A distinguishing feature of recent changes to the US system of public assistance is its increasing focus on *working* families and reliance on the *tax* system to transfer dollars to needy families. After a decade in near total obscurity, the earned income tax credit (EITC) was expanded to become the largest cash-transfer program for lower-income families with children. Advocates of the EITC argue that, unlike traditional welfare, the credit helps “promote both the values of family and work”. Indeed, empirical evidence consistent with economic theory suggests that the EITC promotes employment among eligible unmarried women with children. To target benefits to lower-income families, however, the EITC is based on *family* income, leading to traditional welfare-type disincentives for most eligible secondary earners. In fact, the EITC is likely to reduce overall family labor supply among married couples.

This paper examines the labor force participation response of married couples to EITC expansions between 1984 and 1996. The effect of the credit is estimated using both quasi-experimental and traditional reduced-form labor supply models. Results from both models show the same qualitative conclusion, that the EITC expansions reduced total family labor supply of married couples. In all cases, we find a decline in labor force participation by married women that more than offsets any rise in participation by their spouses. While the labor force participation rate of married men increased by about 0.2 percentage points, that of married women decreased by just over a full percentage point. These aggregate effects mask substantial heterogeneity in the population. Women facing the strongest disincentives were more than 2 percentage points less likely to work after the expansions. These findings imply that the EITC is effectively subsidizing married mothers to stay home, and therefore, have implications for the design of the program.

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1. Introduction

The system of public support for poor families in the United States has undergone a major transformation over the past two decades. Major state and federal reforms to the Aid to Families with Dependent Children (AFDC) program, now known as Temporary Assistance for Needy Families (TANF), have reduced dramatically the role and relevance of traditional welfare. At the same time, a series of tax acts have increased public assistance to the *working* poor; expanding the earned income tax credit (EITC) to become the largest cash-transfer program for lower-income families with children. Over 20 million families are projected to have benefited from the tax credit in 2000, at a total cost to the federal government of about 30 billion dollars (US House of Representatives, 2000).¹

These changes have resulted in part from the long standing criticism that traditional welfare programs generate adverse incentives to work. In fact, advocates of the EITC argue explicitly that redistribution occurs with much less distortion to labor supply, in sharp contrast to other elements of the welfare system. In particular the credit is said to encourage labor force participation. Empirical evidence consistent with economic theory suggests that the EITC promotes employment among eligible unmarried women with children (Eissa and Liebman, 1996; Meyer and Rosenbaum, 2001).

The popular view that the credit “encourages work effort” is unlikely to hold among married couples, however. To target benefits to lower-income families the EITC is based on *family* income (as opposed to individual income), leading to a very different set of incentives for married taxpayers. Primary earners (typically men) may slightly increase labor force participation, but most secondary earners in recipient families are expected to *reduce* their labor supply. Two pieces of empirical evidence suggest that the impact of these disincentives on secondary earners may be substantial: first, labor force participation of secondary earners has been shown to be particularly sensitive to taxes (Triest, 1992); and second, the share of the EITC population facing these disincentives is significant—in 1994 one-third of all recipients with children and about 40% of the phase-out population are married couples (US General Accounting Office (GAO), 1996). Overall, therefore, the EITC is unlikely to generate any positive labor supply for married couples.²

In this paper, we study the labor supply response of married couples to the EITC using Current Population Survey data from 1984 to 1996. Over this period, a series of EITC expansions raised the number of recipient families from 6.4 to 19.5 million and the real value of the maximum credit from \$755 to \$3556 (1996 dollars). We examine the impact of these expansions on the labor force participation decisions of married couples with children. We focus on participation instead of hours worked primarily because the economic predictions (while still ambiguous) are the clearest on the participation margin; because the resulting empirical methods are more credible; and because existing work suggests that the employment margin is important for the

¹ By comparison, federal spending on TANF, which block grants to AFDC, is fixed at about 16 billion dollars per year through the year 2001 (US House of Representatives, 1996).

² If neither spouse is working, the EITC is predicted to increase family labor supply. This effect is unlikely to be important in practice, however, CPS data show that at most 2.5% of less-educated married couples jointly report no employment during this period.

population of interest. By examining directly the labor force participation decision, this paper represents a contribution to existing work on the behavioral effects of the EITC as well as a contribution to the broader labor supply literature.

To identify the population likely to be impacted by the EITC, we limit the sample to married couples with less than 12 years of schooling. We use two empirical approaches. We first employ basic natural experiment methods, where we compare changes in labor supply among EITC eligible and ineligible groups to the 1993 EITC expansion, the largest single expansion during this time. Ultimately these estimates are identified by the comparison of couples with children and childless couples. Our second method limits the sample to married couples with children, parameterizes the effect of EITC and other tax-induced changes, and estimates reduced-form participation equations. These two approaches rely on different sources of identification strategies, and therefore, have different advantages and disadvantages.

Results from both the quasi-experimental and reduced-form models show the same qualitative conclusion, that the EITC expansions reduced total family labor supply of married couples. In all cases, we find a decline in labor force participation by married women that more than offsets any rise in participation by their spouses. The reduced form models suggest that married women were 1.1 percentage points less likely to work, while married men were only 0.2 percentage points more likely to work following the cumulative EITC expansions over this period. These modest aggregate effects mask substantial heterogeneity in the population, however. Married women facing the highest tax rates were 2.1 percentage points less likely to work following the expansions. Comparisons of couples with and without children suggest larger responses to the EITC.

The remainder of the paper is as follows. Section 2 describes relevant features of the EITC, reviews the existing literature and discusses the expected effects of the credit on family labor supply. Section 3 outlines the empirical approaches used in the paper. The data are summarized in Section 4. Section 5 presents the comparison group results, while Section 6 presents the results based on parameterized tax effects. Conclusions are discussed in Section 7.

2. The EITC and family labor supply

The EITC began in 1975 as a modest program aimed at offsetting the social security payroll tax for low-income families with children. There were few changes in the credit in the first 10 years. Since that time, the credit was expanded in the Tax Reform Act of 1986 (TRA86), the Omnibus Reconciliation Act of 1990 (OBRA90), and the Omnibus Reconciliation Act of 1993 (OBRA93).³

A taxpayer's eligibility for the EITC depends on the taxpayer's earned income (or in some cases adjusted gross income), and the number of qualifying children who meet certain age, relationship and residency tests. First, the taxpayer must have positive earned income, defined as wage and salary income, business self-employment income, and farm

³ For more information on the operation of EITC and the expansions, see Liebman (1998); Hotz and Scholz (in press).

self-employment income. Also, the taxpayer must have adjusted gross income and earned income below a specified amount (in 2000, maximum allowable income for a taxpayer with two or more children was \$31,152). Second, a taxpayer must have a qualifying child (under age 19 years, or 24 years if a full-time student, or permanently disabled) who must reside with the taxpayer for more than half the year.⁴ Until 1991, the rules for EITC eligibility were more complicated and depended on the taxpayer's filing status. 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.

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. There are three regions in the credit schedule. The initial phase-in region transfers an amount equal to the subsidy rate times their earnings. In the flat region, the family receives the maximum credit, while in the phase-out region, the credit is phased out at the phase-out rate.

Fig. 1 illustrates the shape of the EITC budget constraint and the effect of the three expansions, by plotting the value of the EITC (in 1996 dollars) against real family earnings for eligible taxpayers with one child (Panel A) and two or more children (Panel B). TRA86 increased the subsidy rate and phase-in income range, resulting in an increase in the maximum credit from \$550 in 1986 to \$953 in 1990 (\$799 in 1986 dollars). OBRA90 further expanded the credit, and introduced a higher benefit schedule for families with two or more children. OBRA93 created the largest expansion of the EITC, with increases in the subsidy rate, maximum credit, and for larger families, the income eligibility range. These figures dramatically illustrate the importance of the OBRA93 expansion, and the differential expansion for families with two or more children. Overall, the subsidy rate increased from 10% in 1984 to 34% (40%) in 1996 for families with one (two or more) children and the real value of the maximum credit increased 185% (370%) for families with one child (two or more children). These expansions represent sources of identifying variation for our two empirical approaches.

To evaluate the impact of the EITC on married couples' labor supply, it is instructive to begin with the impact of the EITC on an unmarried taxpayer. Because the EITC is available only to taxpayers with earned income, standard labor supply theory predicts that the EITC will encourage labor force participation among single parents. The well-being of a taxpayer who does not work has not changed and 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.⁵

⁴ Beginning in 1994, a small credit is available to low-income workers without children.

⁵ As is well known, the positive impact on participation for single parents does not extend to hours worked for taxpayers already in the labor force. While the credit initially increases with income (or hours), producing offsetting income and substitution effects on hours worked, over 70% 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, the phase-out of the credit alters the budget set in such a way that some taxpayers with incomes beyond the phase-out region may choose to reduce their hours of work and take advantage of the credit.

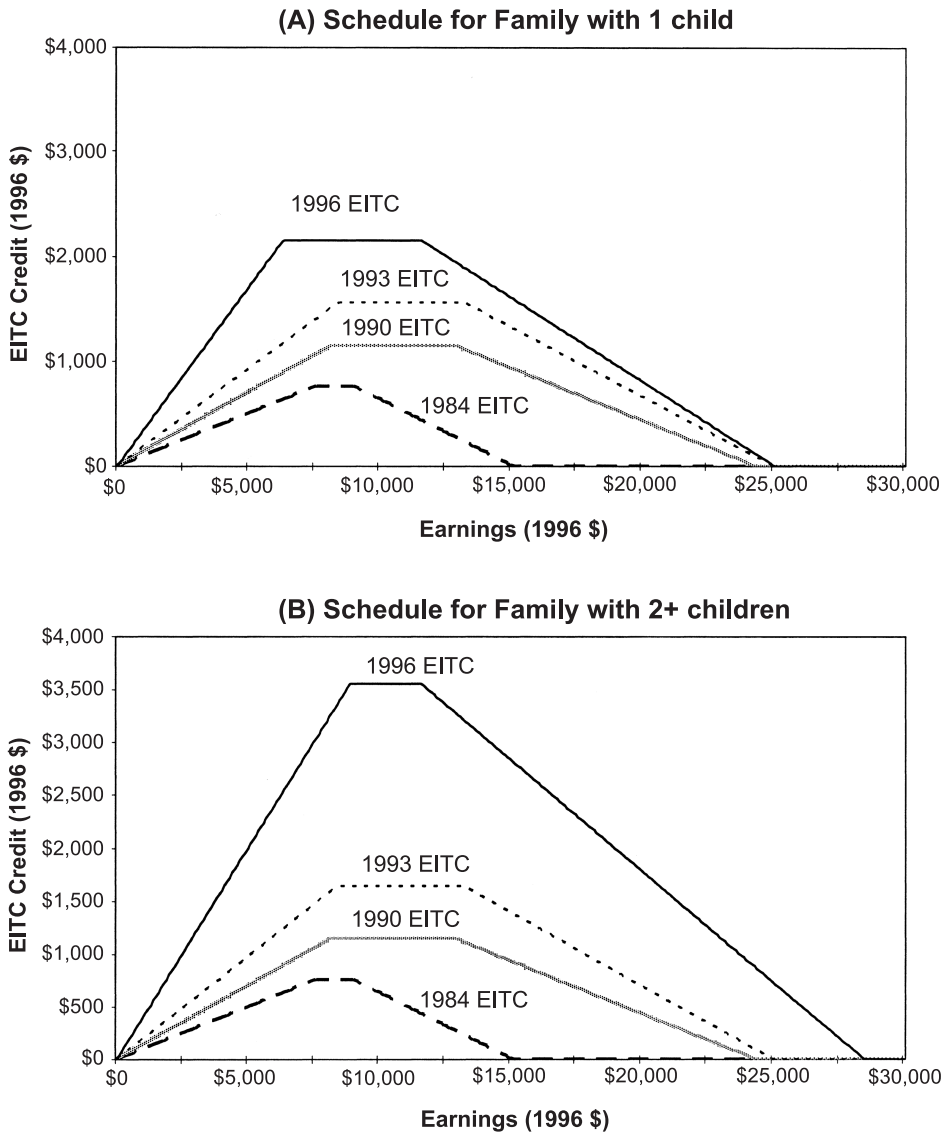


Fig. 1. EITC benefit for selected tax years, by real earnings (1996 dollars). (A) Schedule for family with one child. (B) Schedule for family with 2+ children.

Among married couples, the effect of the EITC on labor force participation is ambiguous. This occurs because the credit is based on *family* income. Consider sequential family labor supply decisions, with the husband as the primary mover and the wife as the secondary mover. In this model, the effect of the credit on the labor supply of primary earners is the same as that of single taxpayers. Labor force participation of primary earners

should increase unambiguously. The incentives for nearly all secondary earners are negative, however. If the family is eligible based on the husband's earnings, the credit adds to unearned income for the secondary earner and generates disincentives to supply labor (because of the income effect). Consider a family with two children in 2000 with the husband earning \$20,000, placing the family firmly in the EITC phase-out region. If the wife remains out of the labor force, her family receives a credit of \$2349. For each dollar of her earnings, the EITC generates a 21% tax (phase-out) rate, which on top of the social security payroll and, possibly, federal and state taxes leads to marginal tax rates exceeding 50%. For some secondary earners, however, the incentives may be positive. If the spouse is not working, the EITC (as in the case of single parents) encourages the wife to enter the labor force. If the primary earner has income in the subsidy region *and* the effect of the greater returns to work dominates the income effect, the EITC would encourage labor force participation.

The overall effect of the EITC on labor force participation of secondary earners, therefore, depends on the distribution of income for married families. Table 1 presents tabulations of IRS and CPS data and shows that the negative participation effect for secondary earners is expected to dominate. The CPS data show that only 4% of less-

Table 1
Distribution of families by EITC credit range

Percent distribution of EITC recipients with children, tax year 1994^a

	Married couples	Single parents
Phase-in or flat	27%	47%
Phase-out	73%	53%
Total	100%	100%

Percent distribution of married couple families with children, tax year 1996^b

	Including women's earnings	Excluding women's earnings	
<i>Less than 12 years of schooling</i>			
Phase-in	7%	10%	–
Flat	6%	8%	–
Phase-out	43%	52%	–
Above phase-out	42%	26%	–
Zero countable income	2%	4%	–
Total	100%	100%	–
<i>12 years of schooling</i>			
Phase-in	1%	4%	–
Flat	2%	3%	–
Phase-out	16%	31%	–
Above phase-out	81%	61%	–
Zero countable income	0%	1%	–
Total	100%	100%	–

^a US General Accounting Office (1996).

^b Author's calculations of March 1997 Current Population Survey.

educated women have spouses with no earnings, while 10% have spouse earnings in the phase-in region. Further, about three-quarters of married EITC recipients (IRS data) and eligibles (CPS data) have income in the phase-out range of the credit, where they face the highest marginal tax rates. This work disincentive for married women stands in sharp contrast to the EITC's goals and to the incentives for single women with children.

A negative effect of the EITC on the labor force participation of married women is likely to translate into a zero or negative effect on the labor supply of *married couples*. This occurs because in addition to the impact on secondary earners, evidence suggests that married men's labor supply is not affected by taxes (Heckman, 1992; Triest, 1992).

In practice, there is little empirical evidence on the magnitude of the EITC effects for married couples with children. Several recent studies have examined the labor supply effects of the EITC on single parents (Dickert et al., 1995; Eissa and Liebman, 1996; Meyer and Rosenbaum, 2000, 2001; Keane and Moffitt, 1998; Ellwood, 2000; Hotz et al., 2002; Grogger, in press). As summarized in the recent review by Hotz and Scholz (in press), these papers consistently find that the EITC increased the labor force participation of single mothers. Dickert et al. (1995) (DHS) and Ellwood (2000) examine the impact on the labor force participation of married couples with children. Using structural (DHS) and quasi-experimental methods (Ellwood), both studies find that the EITC reduces the labor force participation of married women with children. Our approach is similar to Ellwood in that we compare eligible and ineligible groups, but we extend that analysis to parameterize the impact of the EITC and federal taxes on after-tax wages and unearned income.

3. Methods

3.1. "Traditional" model of family labor supply

Our empirical work is based on a simple version of the unitary household labor supply model. As in the theoretical discussion above, we assume a sequential, two-earner model in which the primary earner—the husband—makes his work decision independent of the secondary earner.⁶ The second mover then makes her labor supply decision by maximizing utility, taking account of the primary earner's earnings and other-household unearned income. Accordingly, the wife's labor supply has no effect on the husband's decision, but the husband's labor supply affects the wife's decision (through family income). These restrictions lead to the following pair of labor supply equations:

$$H^1 = h^1(w^1, Y, X) \text{ and } H^2 = h^2(w^2, Y + w^1 H^1, X) \quad (1)$$

where H^1 and H^2 represent hours worked by the husband and wife at wages w^1 and w^2 , respectively; Y is family non-labor income and X is family characteristics. This model allows for consideration of non-participation (in the labor force) as well as taxes and has been widely used in the empirical literature.

⁶ CPS data show that less-educated women are predominantly secondary earners when measured by the share of family earnings they contribute. About 90% of all wives, and 85% of working wives, earn less than their husbands.

This model is especially useful in empirical tax analysis because it identifies exogenous variation in tax rates for secondary earners (wives). The exogeneity arises from the assumption that the husband's work decision is independent of the wife's decision. We estimate Eq. (1) using two alternative methods, both using tax changes for identification.⁷

3.2. Methods for tax reforms as quasi experiments

Our first estimation strategy is based on difference-in-differences methods. This approach compares the outcomes of an affected group (couples with children) to the outcomes of a comparison group that is unaffected by the program (couples without children). The comparison group is assumed to purge any non-program shocks affecting the outcomes of interest. This approach represents a natural starting point for married couples since it has been widely used to evaluate the effect of the EITC on single women. Our approach can be summarized by the following formulation:

$$y_{it} = \gamma\delta_{gt} + \eta_g + \eta_t + X_{it}'\theta + \epsilon_{it} \quad (2)$$

where y refers to labor force participation; η_g is a fixed (group) effect; η_t is a common time effect; δ_{gt} is the interaction between fixed group and time effect; X represents observable characteristics; and ϵ an error term. The program effect is measured by γ , the coefficient on the interaction term δ_{gt} . Two assumptions are required for γ to be unbiased. First, time effects (η_t) must be common across the affected and comparison group. This assumption ensures that the comparison groups mimics underlying labor supply changes of the affected group. Second, the composition of the two groups must remain constant over the period.

We apply this method to the 1993 EITC expansion, and do so for two reasons. First, OBRA93 was the single largest expansion since the introduction of the EITC. Second, it created different incentives for larger families by widening the gap between the first and second child credit. Fig. 2 shows the credit for selected earnings levels for families with one child (Panel A) and with two or more children (Panel B) from 1984 to 1996. It highlights the large relative gains made by families with at least two children. The figure also highlights that the OBRA93 expansion was phased in over 1994–1996 for larger families. While we estimate the average response to this expansion, we also examine the timing of the response in extensions to the basic model.

Clearly, the validity of the experiment rests on the quality of the comparison group, which requires the possibly restrictive assumptions that its behavior exactly mimics the non-EITC behavior of couples with children. We address concerns about the validity of the experiment in Section 5.

⁷ One could alternatively assume that household labor supply is based bargaining between the husband and wife (McElroy and Horney, 1981). These models are of limited use in empirical analysis, however, because they generate few testable hypotheses. More recent work assumes members of the household cooperate and collectively make Pareto-efficient labor supply decisions (Chiappori, 1992). In these models, household members optimally decide individual labor supply, conditional on the allocation of non-labor income using some sharing rule. Taxes have yet to be introduced in collective labor supply models.

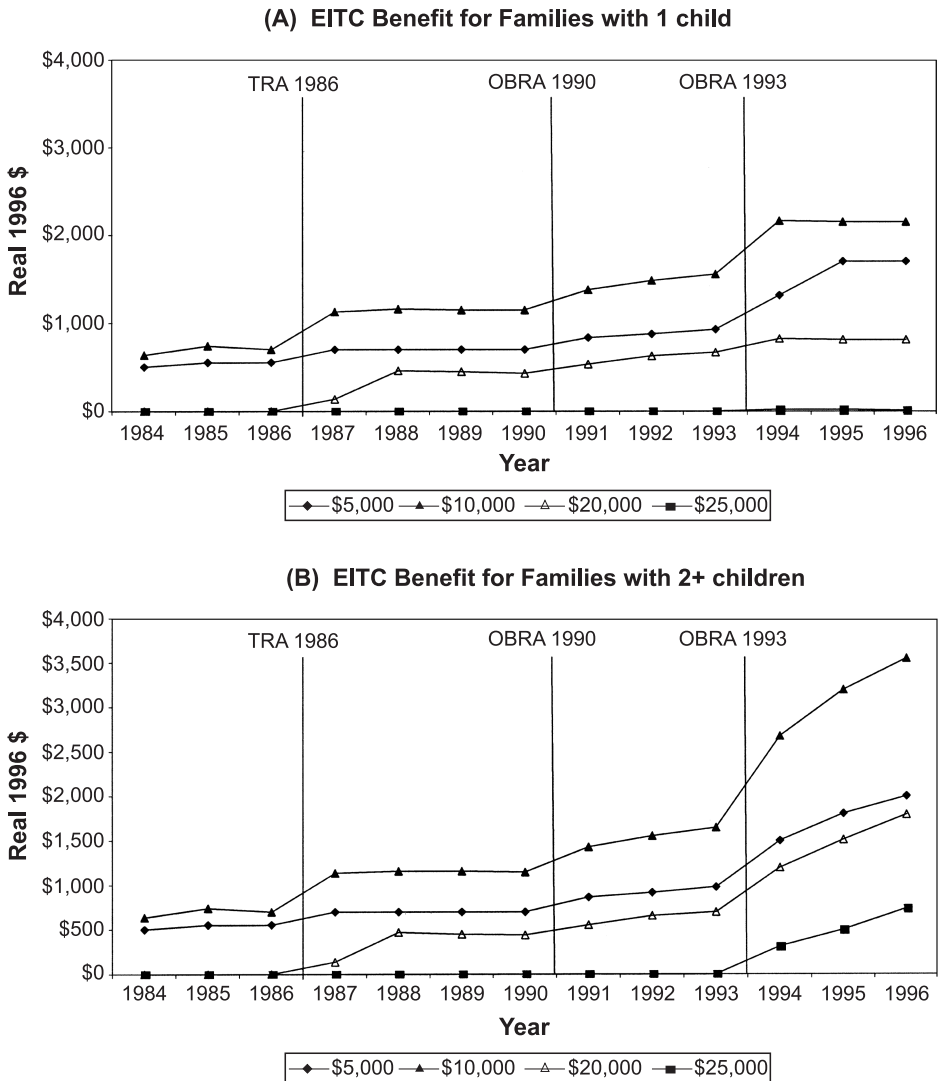


Fig. 2. EITC benefit at selected real earnings levels, by year (1996 dollars). (A) EITC benefit for families with one child. (B) EITC benefit for families with 2+ children.

3.3. Methods for parameterizing EITC and other tax changes

The quasi-experimental approach is attractive because it relies on transparent sources of identification and a simple estimating framework. This advantage is offset, however, by a number of limitations, including the fact that the results depend crucially on the validity of the comparison group. As an alternative approach, we consider a second estimation strategy that has different strengths and weaknesses. First, we limit the sample to the

potentially eligible group—less educated married couples with children—eliminating any identification arising from the group differences. Second, we maintain the secondary earner model and estimate reduced form labor force participation equations that depend on the after-tax wage and after-tax non-labor income. The wage and income effects are identified from changes in EITC (including differential expansion across families with one and two or more children) and other tax changes, gross wages, and non-labor income. To eliminate endogenous variation in taxes arising from the choice of hours worked, we assume a fixed hours choice upon entry into the labor force. In this approach, we use tax changes over the full 1984–1996 period.

We estimate a discrete choice labor force participation equation that controls for net-of-average-tax wage and net unearned income:

$$P_{it} = \Phi(\alpha + \gamma_y y_{it}^n + \gamma_w w_{it}(1 - \tau^a)_{it} + X_{it}'\theta) \quad (3)$$

where y^n is after-tax unearned income, w is the gross hourly wage, τ^a is the average tax rate, and X is a vector of family, state characteristics and fixed state and group-specific time effects. After tax non-labor income represents net income available at 0 h of work. For husbands, as first movers, after tax non-labor income includes the family's capital income and transfers. For wives, as second movers, after tax non-labor income also includes the husband's actual earnings. The after-tax wage represents the net-of-average-tax wage that is faced by a worker moving from 0 h of work to full year, full time (40 h per week, 52 weeks per year) and thus reflects the returns to entering the labor force at full-time work.⁸ These net-of-average-tax wages are likewise calculated using the secondary-earner labor supply model.⁹

These after tax wage and income variables are calculated using a tax calculator that accounts for federal income taxes (including the EITC) and social security payroll taxes.¹⁰ Unearned income, family size (number of children) and the gross wage determine the tax liability at any given hours of work. (The mechanics of the tax model calculations are in Appendix A.) By using earnings at fixed hours of work, we avoid the standard endogeneity problem that arises from the joint determination of taxes and hours worked.

To predict wages for non-workers, we estimate from a log wage equation of the form:

$$\ln(w_i) = Z_i\kappa + \xi_i \quad (4)$$

where Z includes characteristics of the individual (age, education, race), state labor market variables (unemployment rate and average hourly wage), and geographic identifiers (metropolitan status). We use standard Heckman selection correction methods, where

⁸ In extensions to the main estimates, we estimate alternative models where we evaluate τ^a assuming entry at part-time, full-year work.

⁹ In particular, the federal tax liability of spouses is calculated sequentially. The husband's tax liability is calculated using his predicted earnings, and the couple's non-labor income. The wife's tax liability is calculated using her husband's actual earnings, her predicted earnings and the couple's non-labor income.

¹⁰ Married couples with children have low rates of receipt for public assistance programs and thus the tax calculator does not include welfare benefits. Tabulations of the our sample of low educated married couples with children from the March 1997 CPS show that less than 7% had any public assistance income.

we identify the selection term using family characteristics (number of children, presence of young children). To allow for changes in the wage structure over this period, we estimate separate wage equations for each year. Wages are predicted for both workers and non-workers to maintain a consistent stochastic specification.

3.4. Identification

To interpret and compare the empirical results, we clarify the different sources of identifying variation. It is instructive to discuss first the source of variation in individual tax rates. While all married couples face the same tax *schedule* at any point in time, they face different tax *rates* based on their family size—number of children, non-labor income and earned income (wages and hours worked). Additionally, tax schedules, and therefore, rates vary over time with policy reforms.

The main difference between our quasi-experimental approach and reduced form labor force participation equation is in the use of group versus individual-level variation in taxes. The first approach assumes that all relevant wage and income changes are captured by *group* level variation in family type and size (presence and number of children) and time. The EITC effect is the relative (to childless) participation response of couples with children after the EITC expansion. To the extent that tax rates, wages and incomes are measured with error, this grouping approach reduces any measurement error bias in the coefficients of interest.

Our second approach recognizes that policy reforms have non-neutral effects within groups and expands that strategy by using *individual* variation in net wages and net non-labor income. Consequently, identification is based on cross-sectional and time variation in the EITC and federal taxes. In the cross-section, taxes vary by family size (number of children), earnings and unearned income. By using additional information, this approach yields more efficient estimates. The implied behavioral response to the EITC, however, should be identical to the grouping estimate if the experiment is valid.

To the question of why it is useful to use the quasi-experimental approach at all, we note that it is a useful starting point and has some appeal because of its simplicity and transparency.

4. Data

The data we use come from the 1985 to 1997 March Current Population Surveys. The March CPS is an annual demographic file of between 50,000 and 62,000 households. It includes labor market and income information for the previous year, so the data cover tax years 1984–1996, a time period covering the three major EITC expansions.

The sample includes married couples residing in the same household, who are between 25 and 54 years old. In order to capture all tax-filing units, we include married couples primary families, related and unrelated subfamilies. To determine EITC eligibility, we consider any member of the tax-filing unit who is under the age of 19 years (or under 24 years and a full-time student) to be a dependent child for tax

Table 2
Summary statistics for married couples with and without children

	Married couples			
	All	No children	One child	Two or more children
State unemployment rate	6.6 (1.7)	6.5 (1.7)	6.5 (1.7)	6.7 (1.7)
# Children	1.81 (1.51)	0	1	2.9 (1.1)
# Preschool children	0.44 (0.74)	0	0.20 (0.40)	0.72 (0.87)
<i>Wife</i>				
Non-white	0.13	0.15	0.12	0.13
Age	38.0 (7.6)	43.8 (7.2)	39.1 (7.5)	35.1 (6.1)
Education	8.5 (2.5)	8.9 (2.2)	8.8 (2.2)	8.2 (2.6)
Labor force participation	0.577	0.644	0.632	0.524
Unearned income	\$24,928 (16,310)	\$27,312 (17,925)	\$26,726 (17,028)	\$23,206 (15,047)
Average net wage(40 h)	–	–	\$5.52 (3.21)	\$5.50 (3.63)
Net non-labor income	–	–	\$23,233 (12,236)	\$21,279 (11,091)
Gross hourly wage ^a	\$7.56 (5.06)	\$7.87 (4.8)	\$7.63 (4.9)	\$7.36 (5.2)
<i>Husband</i>				
Non-white	0.13	0.14	0.11	0.13
Age	40.4 (7.8)	45.4 (7.4)	41.6 (7.7)	37.8 (6.7)
Education	9.7 (3.2)	10.2 (2.9)	10.1 (3.1)	9.4 (3.4)
Labor force participation	0.959	0.955	0.969	0.958
Unearned income	\$1669 (3767)	\$2046 (4452)	\$1658 (3897)	\$1513 (3364)
Average net wage (40 h)	–	–	\$10.68 (5.14)	\$10.08 (4.90)
Net non-labor income	–	–	\$1535 (3600)	\$1518 (3335)
Gross hourly wage ^a	\$12.09 (7.06)	\$13.08 (7.6)	\$12.7 (7.3)	\$11.39 (6.72)
Observations	22,671	5493	4890	12,288

Source: Authors' tabulations of March CPS for years 1985–1997. Sample includes married couples where the wife has less than a high school education. See text for further sample selection. S.E.s are in parentheses. All dollar amounts are in 1995 dollars.

^a Wage is defined for workers only.

purposes.¹¹ We exclude those couples where one spouse was ill or disabled, in the military, or in school full time during the previous year. We also exclude any couple with negative earned income (due to negative self-employment income), negative unearned income, or with positive earned income but 0 h of work.¹² The resulting sample size, after pooling all 12 years and including all education groups, is 182,958 observations.

The main estimates in the paper are based on a sample of couples with less than a high school education, where the selection is based on the wife's education. We use this criteria to better select couples that are most likely to receive the EITC.¹³ To motivate this choice,

¹¹ Due to data limitations, we omit some criteria for determination of qualified children for the EITC—we do not impose the support test for dependents and we assume that the residency requirement is met.

¹² We also exclude families with taxable unearned income in excess of \$30,000 (in 1995 dollars). This group would not be eligible for the EITC in any year during this period. We drop couples where either the husband or wife has hourly earnings less than \$2 or over \$100 per h (in 1995 dollars) or who derives more than half of their earned income from self-employment.

¹³ Married female's education is highly correlated with their spouse's education (0.67 in our sample). We experimented with classifying groups based on the husband's education and the qualitative results were unchanged.

we note that over 60% of married couples with less than a high school education are eligible for the EITC compared to only 20% of those with exactly a high school degree (see Table 1). Restricting the sample to less educated couples reduces the sample size to 22,671 observations.

Table 2 presents summary statistics of the low educated sample of married couples separately by gender and by family size. The demographic variables used in the analysis are fairly standard and include age, race, education, number and ages of children, and the state unemployment rate. Summary statistics show that married women with children are younger, less educated, more likely to be white, and earn lower wages and have less non-labor income than childless married women. Of interest is the pattern of labor force participation. Among women, the participation rate is lower for mothers, but declines sharply only after the first child. Among their spouses, the participation rate is greater for fathers, and greatest for those with one child. Like their wives, married men with children are younger, earn lower wages and have less unearned income than childless married men.

5. Comparison of group results

5.1. Basic estimates

Our preliminary analysis compares the labor force participation of married couples with and without children before and after the 1993 EITC expansion. The theoretical predictions of the effects of these expansion are ambiguous and depend on the distribution of taxpayers along the income distribution. On net, however, the EITC expansion is expected to reduce labor force participation by married women, and raise labor force participation by married men with children (compared to those without children). Further, one might expect a greater response by couples with larger families.¹⁴ Panel A of Table 3 shows that the maximum credit for couples with at least two children increased by over \$2000 (1996 dollars) between 1989 and 1996, relative to childless couples. The comparable change for families with one child is \$678 dollars. The CPS sample includes tax years 1989–1996, with 1989–1993 as the pre-OBRA93 period and 1994–1996 as the post-OBRA93 period.

The remainder of Table 3 calculates the unconditional difference in difference estimates and shows patterns consistent with the incentives of the EITC expansion. Married women with children are less likely to be employed after 1993—Panel B, while married men are more likely to be employed—Panel C—(relative to their childless counterparts). In both cases, we find (weak) evidence that the changes are more pronounced for couples with at least two children.

Bucking the general trend of rising labor force participation by married women in the United States, women with children were less likely to be in the labor force after the EITC expansion. Relative to the 2.3 percentage point *rise* in the employment of childless women, these figures suggest participation of women with two or more children fell by 5.1

¹⁴ The extent to which this claim holds will of course depend on preferences regarding the labor–leisure choice.

Table 3
EITC maximum credit and mean labor force participation rates of married couples

	Before expansion (1989–1993)	After expansion (1994–1996)	Change	Relative (to no kids) change
<i>Panel A: maximum EITC (1989 to 1996, in 1996 dollars)</i>				
2+ Children	\$1151	\$3556	\$2405	\$2082
One child	\$1151	\$2152	\$1001	\$678
No children	\$0	\$323	\$323	
<i>Panel B: married women</i>				
2+ kids ($N=7095$)	0.533 (0.007)	0.504 (0.010)	−0.029 (0.012)	−0.051 (0.022)
One kid ($N=2648$)	0.642 (0.011)	0.642 (0.017)	+0.001 (0.020)	−0.021 (0.027)
No kids ($N=3120$)	0.653 (0.010)	0.676 (0.015)	+0.023 (0.018)	
<i>Panel C: married men</i>				
2+ kids ($N=7095$)	0.955 (0.003)	0.958 (0.004)	+0.003 (0.005)	+0.014 (0.010)
One kid ($N=2648$)	0.968 (0.004)	0.962 (0.007)	−0.006 (0.008)	+0.005 (0.012)
No kids ($N=3120$)	0.954 (0.005)	0.943 (0.008)	−0.011 (0.009)	

Source: Authors' tabulations of March CPS for years 1990–1997. EITC figures are in nominal dollars. Sample includes married couples where the wife has less than 12 years of education. See text for further sample selection.

percentage points while that of women with one child declined by 2.1 percentage points (with standard errors (S.E.) of 2.2 and 2.7). These labor force participation patterns are not observed for more educated married women.¹⁵ Eligible married men with two or more children (one child) were 1.4 (0.5) percentage points more likely to be in the labor force after 1993 relative to childless men (Panel B of Table 3). In neither case can we rule out a zero effect of the EITC expansions.

It is noteworthy that these participation estimates result in large part from the sizeable changes for the comparison group. Because the estimates depend heavily on the quality of the comparison group, the results should be interpreted with caution.

To address the concerns associated with the use of comparison groups, we extend the analysis to control for observable characteristics of those with and without children. We specify the participation Eq. (2) as follows:

$$P_{it} = \Phi(\alpha + \gamma\delta_{gt} + \eta_g\delta_g + \eta_t\delta_t + X'_{it}\theta) \quad (5)$$

where i , g and t index individual, group and time, respectively. The controls in X are quite standard, and include family characteristics (family size, number of preschool children, and unearned income), individual characteristics (age, race and education), and area characteristics (state unemployment rate). The unearned income of the wife is calculated using the secondary earner assumption, and therefore, includes the husband's actual earnings. X also includes controls for year and state effects. δ_g is equal to 1 if the couple has a child while δ_t is equal to 1 for any tax year after the expansion. δ_{gt} is the interaction

¹⁵ Estimates of models using the sample of married women with 12 years of schooling (more than 12 years of schooling) show that women with children actually *increased* their labor force participation rates relative to those without children by between 1 and 2.5 percentage points (2 and 2.5 percentage points). We report these results in an earlier version of this paper (Eissa and Hoynes, 1998).

of δ_g and δ_t , so that γ measures the relative change in the participation of married couples with children after the EITC expansion.

The marginal effects from the Probit models are presented in Table 4. The panels add successively more controls to the basic regression. Table 4 shows first that demographic characteristics do not explain the observed labor supply behavior of eligible couples after the EITC expansions. Adding demographics to the basic participation regression (Panel B) generates results that are very similar to the unconditional mean changes (Panel A).¹⁶ Relative to the comparison groups, eligible mothers were over 4 percentage points less likely to work while fathers were 0.7 percentage points more likely to be working (with S.E.s of 2.3 and 0.7).¹⁷

To exploit the variation in incentives by family size, we extend the model to allow the EITC effect to vary with the number of children (Panel D of Table 4). The resulting specification is:

$$P_{it} = \Phi(\alpha + \gamma_g \delta_{gt} + \gamma_{g2} \delta_{g2t} + \eta_g \delta_g + \eta_{g2} \delta_{g2} + \eta_t \delta_t + X_{it} \theta) \quad (6)$$

where δ_{g2} is a dummy for two or more children, entered separately and interacted with the post 1993 dummy (δ_{g2t}). The results for mothers are striking, and show that the estimated response for mothers is concentrated among women with at least two children: while all mothers were 1.5 percentage points less likely to be working after the EITC expansions, mothers with larger families were additionally 3.6 percentage points less likely to be working. The findings for men are inconclusive and reflect the lack of statistical significance in the basic results.

We conclude from the results in this section that the EITC expansion did impact the labor force participation of eligible parents, primarily that of mothers and especially that of mothers with at least two children. While estimates show all mothers are 1.4 percentage points less likely to work, the total effect for those with larger families is 5 percentage points. Spouses of these women changed little their participation rates.

5.2. Extensions

A reasonable interpretation of the basic findings is that the 1993 credit expansion affected labor force participation of married couples, primarily that of mothers and especially mothers with two or more children. It is important to note, however, that the identifying assumption in the quasi-experimental analysis—that of no group specific time effects—is ultimately untestable. It is possible, therefore, that the unobserved work preferences of mothers to change differentially over this period coincident with EITC

¹⁶ We present here only the parameters of interest (EITC effect). The full set of parameter estimates is reported in an earlier version of this paper (Eissa and Hoynes, 1998).

¹⁷ The probit is a non-linear model; therefore, the coefficients cannot be directly interpret as marginal effects. Since the treatment effect variable ($kids \times post93$ interaction) is discrete, we calculate the effect of the OBRA93 by predicting two probabilities of participation, one with the interaction variable set equal to 1 and the other with the interaction term set equal to 0. The treatment effect is the average (over the sample of post 1993 men (women) with children) of the difference in the two probabilities of participation. We use the delta method to estimate S.E.s.

Table 4

Difference in difference estimates of labor force participation rates for married couples with and without children

	Married women (dp/dx)	Married men (dp/dx)
<i>Panel A: unconditional means (any kids)</i>		
Any children	− 0.047 (0.021)	0.011 (0.010)
<i>Panel B: basic estimates (any kids)</i>		
γ (any children)	− 0.039 (0.021)	0.008 (0.008)
Log likelihood / (R^2)	− 8106	− 1967
<i>Panel C: kids, 2+ kids unconditional means</i>		
EITC1 (one child)	− 0.024 (0.027)	0.005 (0.010)
EITC2 (2+ children)	− 0.052 (0.022)	0.014 (0.012)
<i>Panel D: kids, 2+ kids, basic estimates</i>		
γ_g (any kids)	− 0.014 (0.027)	0.003 (0.010)
γ_{g2} (2+ children)	− 0.034 (0.024)	0.006 (0.009)
Log likelihood / (R^2)	− 8105	− 1967
Mean of the dependent variable	0.58	0.96
Other controls (all specifications)	Demographics, state unemployment rate, state dummies, time dummies	
Observations	12,863	

Source: Authors' tabulations of March CPS for years 1990–1997. Sample includes married couples where the wife has less than 12 years of education. See text for further sample selection. Parameter estimates for labor force participation are probability derivatives (dp/dx) from a Probit estimation where dummy variables are measured as the change in predicted probability from going from 0 to 1. Each equation also includes controls for demographic variables (number and ages of children, race, age, unearned income), state unemployment rate, state dummies, and time dummies.

expansions, for example. This section presents direct and indirect evidence about reasonable alternative explanations for our findings.

A primary concern is that the composition of the two groups could change in a number of ways. Careful examination of the data show that mean demographic characteristics (age, education, race) did not change differentially over the period. In the cross section, however, average differences in observable characteristics mask substantial variation across the groups. Married couples with children, for example, have noticeably different age distributions than couples without children (see Fig. 3). The fact that these two groups are at very different points in the life-cycle may confound the results if there are cohort specific labor supply trends.¹⁸ In addition, our selection of groups based on a fixed education level may generate a different composition of the sample over time given the trends in educational attainment. We estimated models using samples from fixed percentiles of the education distribution (e.g. bottom 10%) and found results that support our main findings for couples with less than a high school education.¹⁹

¹⁸ The results were robust to including birth cohort-year interactions.

¹⁹ Another possible change in sample is due to endogenous marriage and childbearing. While EITC expansions altered the incentives to marry and to have children, empirical evidence suggests relatively small responses on these margins (Dickert and Houser, 1998; Eissa and Hoynes, 2000; Ellwood, 2000).

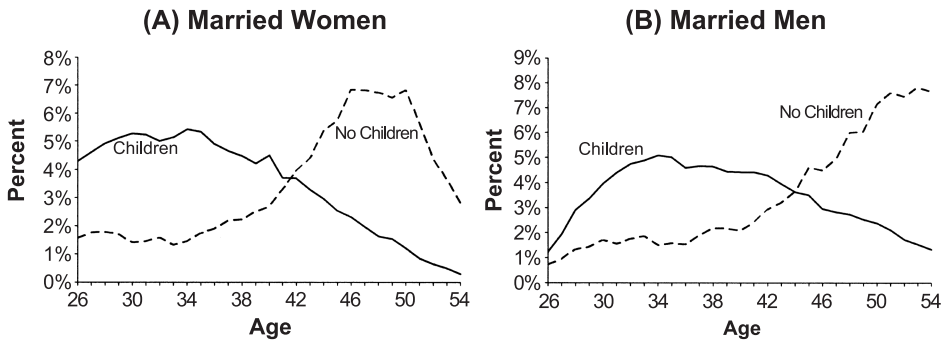


Fig. 3. Age distributions for married couples by presence of children. Authors' calculations of the 1985–1997 March Current Population Survey.

More generally, one may be concerned that long-term labor supply trends may differ for married couples with and without children. As a first pass, we plot labor force participation rates for women with no children, one child and at least two children from 1984 to 1996 (Fig. 4). Among the likely eligibles (less than 12 years of schooling), we find no striking

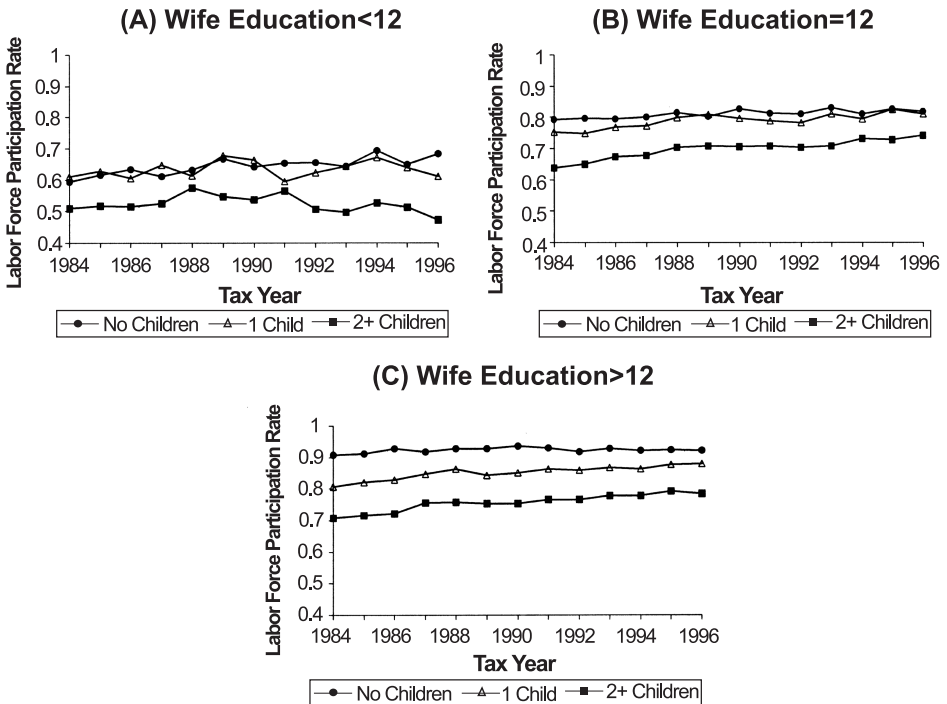


Fig. 4. Trends in labor force participation of married women by education and number of children. (A) Wife education <12; (B) wife education = 12; (C) wife education >12. Authors' calculations of the 1985–1997 March Current Population Survey. Labor force participation rate defined as fraction working at all last year.

Table 5

Difference-in-differences estimates of labor force participation rates with unrestricted time effects, 1984–1996

	Married women	Married men
<i>Year dummies × any child</i>		
1985	−0.011 (0.036)	0.026 (0.011) **
1986	−0.037 (0.037)	0.021 (0.011) *
1987	0.004 (0.037)	0.012 (0.011)
1988	0.005 (0.038)	0.025 (0.012) **
1989	−0.015 (0.037)	0.028 (0.012) **
1990	−0.002 (0.037)	0.021 (0.012) *
1991	−0.003 (0.038)	0.009 (0.011)
1992	−0.049 (0.039)	0.019 (0.011) *
1993	−0.035 (0.040)	0.017 (0.011)
1994	−0.045 (0.041)	0.027 (0.012) **
1995	−0.032 (0.041)	0.030 (0.012) **
1996	−0.117 (0.042) ***	0.014 (0.012)
Number of observations	22,718	22,718
Pseudo R^2	0.0658	0.1552

Source: Authors' tabulations of March CPS for years 1985–1997 covering tax years 1984–1996. The sample includes married couples where the wife has less than 12 years of education. Parameter estimates for labor force participation are probability derivatives (dp/dx) from a Probit estimation where dummy variables are measured as the change in predicted probability from going from 0 to 1. Each equation also includes controls for demographic variables (age, race, number and ages of children, any child dummy, unearned income), state dummies, state labor market variables, and year effects for both groups. The omitted year is 1984. The *, **, *** indicates statistical significance at the 1%, 5%, and 10% levels.

evidence of differential long-term trends by family size. Employment starts declining after 1991 and continues declining after 1994 for the least educated women with at least two children. No such pattern emerges for more educated (ineligible) women. Clearly this evidence is only suggestive. We, therefore, explore more formally the potential importance of differential labor supply trends among less-educated couples by estimating a flexible version of the participation model. Rather than a pre–post specification, we re-estimate the participation Eq. (5) for the full 1984–1996 period, with year dummies entered separately and interacted with the children dummy.

The year effects for married couples with children are presented in Table 5. For married women, we note three observations. First, the point estimates are either negative or (effectively) zero in each year. Second, the size of the estimates generally increases over time, along with the maximum credit amount. To highlight this point, we plot in Fig. 5 the estimated year effects along with the average credit amount.²⁰ The figure suggests clearly that married women's labor force participation responds to the EITC, especially following the last and most substantial expansion. The only period where we do not observe any hint of a negative response is following the 1986 expansion. This finding should not be surprising because the credit amount was small and the program affected very few married

²⁰ We calculate the average credit amount for a secondary earner (the wife) given the 1996 distribution of husband's earnings. By holding constant the distribution of husband's earnings, we ensure that the average credit is altered only by policy changes.

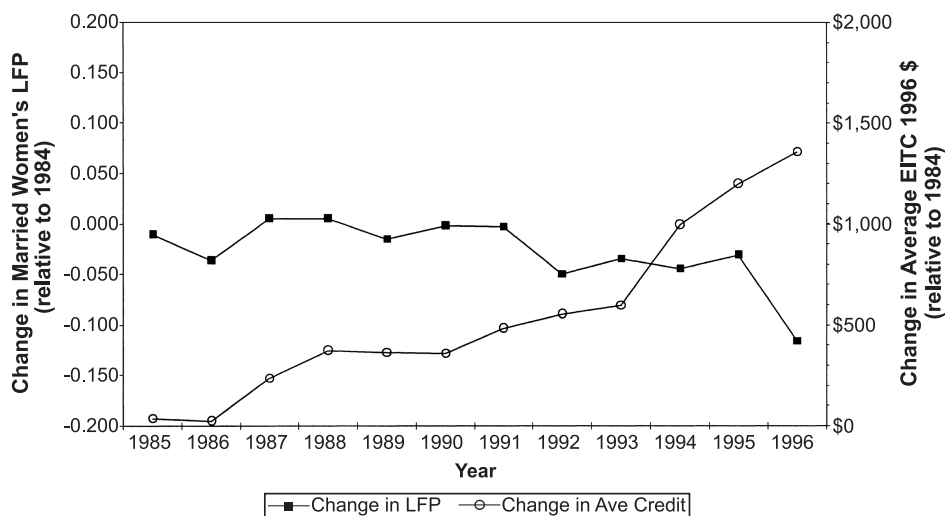


Fig. 5. Year effects for married women with children and average EITC for non-working secondary earner. The “change in married women’s LFP” are from Table 5, estimates of the year dummies interacted with any child dummy. The average credit amount is calculated for a secondary earner (the wife) given the 1996 distribution of husband’s earnings. By holding constant the distribution of husband’s earnings, we ensure that the average credit is altered only by policy changes.

couples (the maximum income for the EITC in 1986 was only \$11,000). The third observation is that only the 1996 point estimate is statistically significant. The lack of statistical precision is a concern, but it is not clear that the difference-in-differences approach is best suited to estimate the response to the EITC with precision. Before the 1993 expansion, the year to year increases in the EITC are small enough (especially as a share of family income for married women) that a group comparison between mothers and childless women may not precisely identify the response.

It is reasonable to conclude that the difference-in-differences results presented in this section are *not inconsistent* with the EITC having a negative effect on the participation of married women. Sensible alternative explanations (such as changes in the composition of the groups, cohort-specific trends, and different long-term participation trends) do not explain away our basic findings. We are confident in concluding that the EITC has an effect on the labor force participation decisions of married couples that is worth exploring more fully in the context of parameterized models.²¹

²¹ We also conducted many other robustness checks. To address concerns about differential effects of the business cycle on married couples with children, we interact the state unemployment rate with the kids dummy. We find no change in the estimated EITC effect. To address concerns about the arbitrary choice of years before and after the policy expansion, we change the pre-OBRA93 period to 1989–1990 (instead of 1989–1993). We find somewhat stronger participation responses in the direction predicted by the EITC expansion for both men and women. We also explore extending the time period through 1998. The estimated results vary somewhat but the qualitative conclusions are unchanged.

6. Results using variation in taxes, wages and income

6.1. Basic results

In this section, we parameterize the impact of the EITC and other tax changes on after-tax income and wages, and examine its effects on married couples with children. To take advantage of multiple tax reforms and enhance identification, we expand the time period to 1984–1996 and, as a result, the sample to 17,178 couples. We repeat our Probit estimating equation from Section 3:

$$P_{it} = \Phi(\alpha + \gamma_y y_{it}^n + \gamma_w w_{it}(1 - \tau^a)_{it} + X_{it}\theta) \quad (3')$$

where y^n is after tax non-labor income, w is the gross (predicted) hourly wage, τ^a is the *average* tax rate—calculated for entry into the labor market at full year, full time (40 h per week) work. Because of the secondary-earner model, the wife's after-tax non-labor income includes family unearned income and the husband's actual earnings. Further, the wife's tax rate is calculated using her husband's actual earnings, her predicted earnings and the couple's non-labor income. The husband's tax rate, however, is calculated using his predicted earnings and the couple's non-labor income but excludes his wife's earnings.

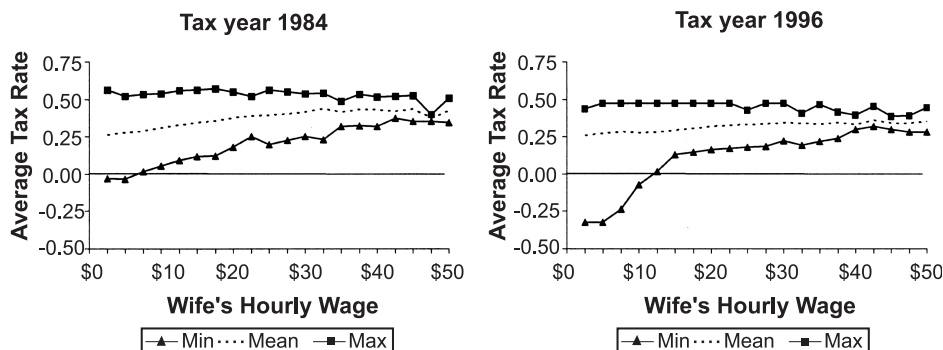
The control vector X includes family characteristics (number and ages of children, race, age), state characteristics (unemployment rates) as well as state fixed effects, year effects, and separate year effects for families with two or more children. The year effects absorb any differences in trends by family size that may be correlated with changes in after-tax earnings (i.e. tax policy and wage opportunities). The tax effects, therefore, operate through exogenous characteristics of the household— including family size, (gross) non-labor income and wages, and (for wives) husband's earnings. This cross-sectional variation in taxes, along with the policy changes, identify the model.

We illustrate the within sample tax variation in Fig. 6a and b, which plot average tax rates by gross hourly wages for the sample in 1984, 1990 and 1996. The figures present mean, minimum and maximum average tax rates for men and women. The figures illustrate three major sources of variation—the shape of the federal income-tax schedule; demographics (family size) and non-labor income; and finally, the 1986, 1990 and 1993 tax reforms. A striking observation is the progressivity in the tax schedule at the lower end of the wage distribution by 1996. At the lowest hourly wages, a negative tax rate is generated by the EITC subsidy. The combination of family taxation and a progressive tax schedule generates a different pattern of average tax rates for secondary earners: wives' average tax rates are generally higher, more dispersed *and* flatter throughout their earnings distribution.

Table 6 presents the main labor force participation estimates for the Probit model for wives (column 1) and husbands (column 2). To ease interpretation of the parameters, we present the marginal effects.²² Consistent with labor supply theory, higher net wages and

²² Specifically, the estimates can be interpreted as the effect of a unit change in continuous variables, and of a change from 0 to 1 in discrete variables on the probability of working. All demographic variables have the expected effects. Married couples with more children, younger children, living in areas with higher unemployment rates are less likely to work. White women, *ceteris paribus*, are less likely to work than non-white women, while white men are more likely to work than non-white men.

Panel A Married Women



Panel B Married Men



Fig. 6. Average tax rates for married men and women by own hourly wage [full time employment]. Panel A: married women; Panel B: married men. Average tax rates calculated for moving from no work to full time employment. Women are assumed to be secondary earners and their non-labor income includes the earnings of the husband. Men are assumed to be primary earners. Earnings of the wife do not enter their calculation.

lower non-labor income are associated with higher labor force participation. A \$1 increase in the net wage raises the likelihood that wives work by 2.7 percentage points, or 4.2%, with an implied “elasticity” of 0.267. For the spouses, the respective wage effect is 0.23 percentage points, implying an elasticity of 0.032. A \$1000 increase in net unearned income reduces the participation of wives by 0.1 percentage points and of husbands by 0.5 percentage points, implying income elasticities of -0.039 and -0.007 , respectively.²³

These estimates seem reasonable. Evaluating them is difficult, however, because the literature provides few benchmarks. [Triest \(1992\)](#) concludes that married women’s labor

²³ Because participation rates are very high for men (about 96%), the elasticities of non-participation are substantially higher than elasticities of participation.

Table 6

Parameter estimates for labor force participation equation for married couples with children, 1984–1996

Variable	Married women	Married men
<i>Specification: average tax rate evaluated at full-time (40 h)</i>		
# of children	– 0.045 (0.0065)	– 0.003 (0.001)
# preschool children	– 0.109 (0.006)	– 0.005 (0.001)
Black	0.076 (0.017)	– 0.025 (0.007)
Other race	0.014 (0.017)	– 0.048 (0.008)
Age	0.045 (0.006)	0.001 (0.002)
Age squared (per 100)	– 0.067 (0.008)	– 0.001 (0.002)
State unemployment rate	– 0.004 (0.004)	– 0.004 (0.001)
Net wage, $w(1 - \tau^a)$	0.027 (0.005)	0.003 (0.001)
Net unearned income, y^n	– 0.001 (0.0003)	– 0.005 (0.0003)
Other controls	State, time dummies, 2+ children \times time interactions	
Pseudo R^2	0.07	0.18
Mean of dep. variable	0.556	0.960
Observations		17,178
<i>“Elasticity” of participation</i>		
Wage	0.267	0.032
Income	– 0.039	– 0.007

Source: Authors' tabulations of 1985–1997 March CPS. Sample includes married couples where the wife has less than 12 years of education. See text for further sample selection. The net wage is the gross predicted hourly wage times one minus the average tax rate from entering the labor market at full-time hours. Parameter estimates for labor force participation are probability derivatives (dp/dx) from Probit estimation. S.E.s in parentheses.

force participation is likely to be more responsive to taxes than their hours worked because his estimates show higher labor supply elasticities when using *all* women as opposed to *working* women.²⁴ In his sensitivity analysis of married women's hours of work, Mroz (1987) makes a similar point with respect to gross wages.

For our purposes, we test the sensitivity of the results to different calculations of after-tax wages and incomes (Panels A and B of Table 7), and to the estimation sample (Panel C). Calculating average tax rates for part-time work (20 h per week) reduces the estimated wage effects for both wives and husbands, although only slightly for the latter. Using actual wages for workers and predicted wages for non-workers has little effect on the estimated parameters. Finally expanding the sample to include parents with 12 years of schooling reduces the estimated wage effect for women and the income effect for men, but does not change the qualitative results.

6.2. Simulating effects of EITC

Using the estimates in Table 6, we simulate the labor force participation response to the EITC expansion. For the sample of married couples in 1996, we predict labor force participation under two parameters: net of average-tax wages and incomes calculated under 1996 and 1984 EITC rules. Held constant in this calculation are all other tax parameters, gross wages and family size (details on the simulation procedure are in Appendix B).

²⁴ No such finding occurred for married men in Triest's analysis.

Table 7
Parameter estimates for labor force participation equation under alternative specifications

	Wife	Husband
<i>Panel A: sample: education of the wife < 12. Specification: average tax rate evaluated at part-time (20 h)</i>		
Average net-of-tax wage $w(1 - \tau^a)$	0.012 (0.004)	0.002 (0.0005)
Net unearned income, y^n	-0.001 (0.0004)	-0.005 (0.0003)
Other controls	Demographics, state unemployment rate, state dummies, time dummies, 2+ children \times time interactions	
Pseudo R^2	0.07	0.18
Mean of dep. variable	0.556	0.960
Observations		17,178
<i>Panel B: sample: education of the wife < 12. Specification: actual wages for workers</i>		
Average net-of-tax wage $w(1 - \tau^a)$	0.021 (0.002)	0.0004 (0.0001)
Net unearned income, y^n	-0.002 (0.0003)	-0.005 (0.0003)
Other controls	Demographics, state unemployment rate, state dummies, time dummies, 2+ children \times time interactions	
Pseudo R^2	0.07	0.17
Mean of dep. variable	0.556	0.960
Observations		17,178
<i>Panel C: sample: education of the wife ≤ 12. Specification: average tax rate evaluated at full-time (40 h)</i>		
Average net-of-tax wage $w(1 - \tau^a)$	0.016 (0.003)	0.003 (0.0002)
Net unearned income, y^n	-0.003 (0.0001)	-0.002 (0.0001)
Other controls	Demographics, state unemployment rate, state dummies, time dummies, 2+ children \times time interactions	
Pseudo R^2	0.08	0.13
Mean of dep. variable	0.686	0.980
Observations		74,107

Sample: Married couples with children, 1984–1996. Source: Authors' tabulations of 1985–1997 March CPS. See text for further sample selection. Average net wage is the gross hourly wage times one minus the average tax rate from entering the labor market at part-time or full-time work. Parameter estimates for labor force participation are probability derivatives (dp/dx) from a Probit estimation. S.E.s in parentheses.

Table 8 presents simulations of the total impact of EITC expansions from 1984 to 1996. Overall, the results suggest that the expansions had modest effects on the participation rates of married men and women with children: married mothers were 1.1 percentage points (2.4%) less likely to work in 1996, while fathers were only 0.2 percentage points (or 0.2%) more likely to be working.

An initial reaction to the participation responses in Table 8 may be that the estimates are small, especially given the size of the EITC expansions. Two points are worth noting here. First, for wives the EITC operates primarily through the income effect, which is estimated to be quite small. Second, the overall EITC effect masks substantial heterogeneity across the income distribution. Table 8 shows these heterogeneous effects by predicted husband's hourly wage and across regions of the 1996 EITC schedule.

The response of married men is minimal across the entire wage distribution. Even men in the lowest wage decile are only one half-a-percentage point more likely to participate in 1996. Further, we observe essentially no change in the employment rate of men beyond the 40th percentile. Married women's labor force participation responses are far less

Table 8
 Simulated changes in labor force participation responses for EITC expansion 1984–1996

	Percent of sample	Married women		Married men		Family	
		Change in employment probability		Change in employment probability		EITC	
		Level	Percent	Level	Percent	Gross	Net
Overall	100	-0.011	-2.4	0.002	0.2	927	858
<i>Grouping by husband's predicted wage</i>							
Decile 1		-0.017	-4.2	0.006	0.6	1379	1315
Decile 2		-0.016	-3.8	0.004	0.4	1349	1279
Decile 3		-0.015	-3.6	0.003	0.3	1218	1132
Decile 4		-0.013	-3.0	0.003	0.3	1087	1022
Decile 5		-0.013	-2.3	0.002	0.2	1019	939
Decile 6		-0.011	-1.8	0.002	0.2	778	718
Decile 7		-0.007	-1.5	0.002	0.2	736	704
Decile 8		-0.010	-1.8	0.000	0.0	650	539
Decile 9		-0.009	-1.7	0.000	0.0	642	546
Decile 10		-0.005	-0.9	0.000	0.0	415	356
<i>Grouping by location in 1996 EITC segment</i>							
Phase-in	8.8	0.011	10.0	0.004	0.6	1144	1289
Flat	6.0	-0.015	-6.5	0.002	0.2	2424	2355
Phase-out	42.9	-0.021	-5.0	0.002	0.2	1591	1455
>Phase-out	42.3	-0.006	-0.8	0.001	0.1	0	-41

The simulations are based on estimates of the Probit labor force participation equations reported in Table 5. The equations control for average net of tax wages, net non-labor income, demographics, state dummies, and time dummies. The simulations are based on predictions of the labor force participation equations using 1984 EITC tax parameters compared to 1996 EITC tax parameters. All other taxes and regression variables are held constant in the simulations. The percent change in labor force participation is calculated using the cell specific participation rate. All dollar figures are in 1995 dollars.

concentrated—in part because they depend as well on husband earnings, and are as high as -1.7 percentage points. The largest responses, nonetheless, are observed for women married to the lowest wage men. Because the wife's EITC is based on her husband's *earnings*, the observed participation behavior by her spouses' *wage* is an important consistency check and is not a artifact of the model.

At the bottom of Table 8 where we present responses by location along the 1996 EITC schedule (generated using actual family earnings in 1996). As predicted by theory, employment increases uniformly for men and for women in the phase-in, but falls for women beyond the phase-in region of the EITC. Because the vast majority of married couples are located in the flat to phase-out regions of the EITC, the overall labor force participation of married women falls. In addition, the estimated effects here are substantial. Women in the phase-out region (43% of the sample) are more than 2 percentage points less likely to work after the EITC expansion.

The last two columns of Table 8 quantify the overall work disincentive effects of the EITC. The "change in gross EITC" represents the difference in the family's EITC under 1996 law and 1984 law, assuming no change in labor supply. The "net EITC" adjusts the

gross measure by the value of the simulated labor supply responses by both the husband and wife. Overall, the expansions increased the average EITC transfer by \$927, much less than the increase in the maximum credit due to the location of eligible families in the phase-out region and beyond (ineligible couples). After accounting for the behavioral response of higher husband earnings and lower wife earnings, the change in the net EITC transfer is \$858. Only \$69 or 7% of the transfer is lost through labor supply distortions. We should note that these calculations do not account for the fewer hours worked by working taxpayers, and therefore, represent lower bound estimates of the transfer lost through changes in labor supply.

6.3. Comparing results

To compare to the results in the two methods, we perform simulations like [Table 8](#) examining only the OBRA93 expansion. These results, not presented here, show about half the total response estimated in [Table 8](#) can be attributed to the OBRA93 expansion: 0.1 percentage point increase for men and 0.6 percentage point decrease for women, substantially smaller than what is suggested by the quasi-experimental approach.²⁵ One explanation for this difference traces the effect of childless couples as a comparison group in the quasi-experimental approach. The comparison group generates the counterfactual “what would have happened to labor force participation without the EITC expansion”. [Table 3](#) shows substantial changes in labor force participation by couples without children, in the opposite direction of what is predicted by the EITC expansion. The net result of using childless couples, therefore, is a larger EITC effect.

Given that the empirical approaches used in this paper rely on different sources of identification, it is not surprising that the results imply somewhat different estimates of the size of the response to the EITC expansion. It is particularly noteworthy, however, that the same qualitative results emerge. Consistently the story that emerges is that overall family labor supply falls, driven exclusively by the decline in married women’s labor force participation.

7. Conclusions

This paper evaluates the labor supply response of married couples to expansions of the EITC. We examine the labor force participation response using Current Population Survey data from 1984 to 1996 and two empirical approaches. We first employ basic natural experiment methods, where we compare changes in labor supply among EITC eligible and ineligible groups. Second, we parameterize the EITC and tax incentives, and estimate the discrete work-no work choice at fixed hours in a reduced form model. These two approaches rely on different sources of identification strategies, and therefore, have

²⁵ Note that the quasi-experimental treatment effect is not completely comparable to the OBRA93 estimate presented here. In the quasi-experimental analysis, the “before” period included years 1989–1993, which includes 2 years of data on labor force participation before the OBRA90 years. The OBRA90 EITC change, while smaller than the 1993 change, would result in similar predictions for labor supply. These additional years could explain the larger responses estimated in the quasi-experimental approach.

different advantages and disadvantages. Ultimately, we evaluate whether the two approaches lead to similar qualitative conclusions.

The main estimates are based on a sample of married couples with less than 12 years of schooling, chosen because they are most likely to be affected by the EITC. While a number of papers have evaluated the EITC's effect on the labor supply of single women (and a few on married couples), this is the first paper that examines the participation decisions of married couples using tax reform variation.

Results from both the quasi-experimental and reduced form models consistently suggest that the EITC expansions reduced total family labor supply. This finding stands in sharp contrast to that of single women with children, who are shown to substantially increase labor supply in response to the EITC. The reduced-form models show that EITC expansions between 1984 and 1996 attracted a small number of married men into the labor market—the rate of participation rose by a mere 0.2 percentage points; not a surprising result given their small labor supply elasticities and high participation rates. Consistent with the theoretical predictions of the secondary earner model, we find that married women reduced their labor force participation in response to the EITC expansions, by an estimated 1 percentage point. These modest aggregate distortions, however, mask substantial heterogeneity across the population of married EITC-eligible families. Women in the phase-out of the EITC are more than 2 percentage points (5%) less likely to work.

Our results imply that the EITC is effectively subsidizing married mothers to stay at home, and therefore, have implications for the design of the program. We make no value judgement about this feature of the credit, but note that the EITC incentives for single mothers are quite different. If the main objective of the EITC is to encourage labor market participation, then an EITC that is based on individual earnings (as opposed to family earnings) would offset the incentive for secondary earners to leave the labor force. That option, however, could violate accepted notions of horizontal equity and would be quite costly: according to the Congressional Budget Office, \$11 billion per year at current EITC parameters. Another option is to make the credit a wage (as opposed to earnings) subsidy, possibly implemented as an earnings subsidy with minimum hours requirement. Implementation of such a wage subsidy for married couples would be complicated by the need to take into account the spouse's hours and earnings. Evaluating these and other alternatives to the current setup of the EITC should be of high priority for economists interested in taxation or in transfer program design.

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Appendix A. Tax calculator

Our tax model calculates federal taxes and payroll taxes and covers tax years 1984–1996. We assume that all married couples file jointly and take the standard deduction. Our tax calculator does not include state income taxes. Therefore, we do not model the presence of the state supplements to the EITC, now available in many states. These are growing in importance, but were small relative to the federal credit during most of our sample. While in principle these simplifications could lead to measurement problems, in practice our estimated tax rates are very highly correlated with those produced by NBER's TAXSIM model (which includes state taxes and models itemizers).

There are two tax variables that are used in the estimation of the reduced form labor force participation equation: net of tax non-labor income y^n , and net of average tax wage $w(1 - \tau^a)$. The *average tax rate* τ^a is calculated as the change in net-of-tax income over the change in gross earnings that results from entering the labor force at some level. We consider entry at full-time (40 h per week) full-year work and part-time (20 h) full-year work.

All of the tax calculations assume a secondary-earner model. Accordingly, the primary earner's (husband's) taxes are computed without taking account of the spouse's labor supply choice. For example, the husband's net non-labor income is the family's after tax non-labor income and *her average tax rate* is a function of his hourly wage, non-labor income and tax parameters. All of the wife's calculations, on the other hand, use actual husband's earnings. Her average tax rates will, therefore, depend on which EITC region her husband's earnings place the family.

Appendix B. EITC simulations

The goal of our simulations is to obtain estimates of the effect of the EITC on the labor supply of married couples. The simulations are based on our sample of low education married couples in 1996. We compare predicted labor supply based on tax laws in 1996, to what their labor supply would be if they faced a different EITC schedule. In particular, we consider two alternative simulations. We consider how labor supply would change if the household faces (1) the 1984 schedule for the EITC, or (2) the 1993 schedule for the EITC. In each case, we assume that all other values remain fixed. In particular, there is no change in gross wages, non-labor income, family structure, spouse's earnings (for the wife), and no other changes in taxes. That is, we do not apply all tax laws in 1984, but just the EITC schedule for 1984.

We use our tax calculator to generate values for the after tax wage and income variables under 1996 law and the alternative simulation. Labor supply is predicted in each case, and the simulation tables present the change in labor supply. We present the results of the simulations for the full sample, and for two different groupings of married couples: by deciles of the husband's gross hourly wage distribution and regions of the 1996 EITC schedule (phase-in, flat, phase-out, above phase-out). The regions of the EITC are assigned using the 1996 EITC schedule, and are based on actual family earnings and adjusted gross income.

To translate changes in labor force participation into changes in annual earnings, we assume that each individual within a particular group (e.g. those in the lowest decile of the wage distribution) have the mean level of wages and annual hours among all *workers* in that group.

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