

**Labor Supply at the Extensive and Intensive Margins:
The EITC, Welfare and Hours Worked**

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ABSTRACT

It is commonly asserted that labor supply responses at the extensive margin (participation) are much greater than at the intensive margin (hours). Nevertheless, this pattern has not been extensively documented. Furthermore, current models of labor supply used in estimation and simulation do not incorporate this response difference. This paper examines these issues in the context of recent changes in the Earned Income Tax Credit (EITC) and welfare reform. The EITC unequivocally encourages single parents to work at least some hours during a year because it shifts out the budget set at all positive hours points. This prediction has been extensively confirmed in the data. Theory also implies that the EITC will decrease hours worked among those already working. For the vast majority of recipients on the plateau or phase-out portions of the credit, the EITC reduces or does not change the after-tax wage while at the same time discouraging work through the income effect of the credit payment. However, recent hours worked patterns for EITC eligible individuals do not appear to fit this second prediction. Hours worked per week and weeks worked during the year among likely recipient groups have not fallen. This paper documents these facts and argues that alternative models of labor supply that recognize differential participation and hours responses should be used in both estimation and policy simulations.

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Some previous studies have emphasized differences between labor supply responses on the extensive margin (participation) and intensive margin (hours worked) such as James J. Heckman (1993) and Jean Kimmel and Thomas J. Kniesner (1998). Recent tax and welfare policy changes provide a potentially more convincing way of identifying these responses than is available in other non-experimental data. The Earned Income Tax Credit (EITC) changes during the 1990-1996 period sharply altered the budget sets of single mothers over a short period of time. These changes in incentives are likely to be unrelated to differences across individuals in the desire to work, and thus are likely to be exogenous to labor supply decisions. This lack of exogeneity is harder to claim for wage differences across people, which are the main alternative source of identifying variation. In addition to preference heterogeneity, wages are driven by supply and demand factors that one must account for to obtain valid estimates using wage variation.

The EITC unequivocally encourages single parents to work at least some hours during a year because it shifts out the budget set at all positive hours points. This first prediction is clearly confirmed by the data. In addition, theory implies that the EITC will decrease hours worked among those already working because most recipients are on the plateau or phase-out portions of the credit schedule. For these recipients, the EITC reduces or does not affect the after-tax wage while at the same time discouraging work through the income effect of the credit payment. However, recent hours worked patterns for EITC eligible individuals do not appear to fit this second prediction. Hours and weeks worked by likely recipient groups have not fallen. This paper analyzes this puzzling finding, building on earlier work by Nada Eissa and Jeffrey Liebman

(1996) and Bruce D. Meyer and Dan T. Rosenbaum (1999).¹

This study shows that nearly all of the labor supply adjustment of single mothers occurs at the extensive margin, not the intensive margin. This finding raises the issue of what model features are needed to explain both participation and hours, but leaves the answer to be provided in future work. This finding also suggests that the large literature simulating alternative policies for low wage workers such as the EITC may be misleading because nearly all work has used models that imply similar responses on participation and hours margins.

I. How Have Work Incentives Changed in Recent Years?

A. Incentives to Work at all During the Year

During the 1986-2000 period, incentives to work during the year changed sharply. Meyer and Rosenbaum (2000) describes the policy changes in detail up to the last few years of this period. I focus particularly on the 1990 through 1997 period, but provide data on the longer period for context and some comparisons. Over this period, tax incentives almost entirely from the EITC increased annual net of tax earnings by an amount just under \$1,000 on average for single mothers (who earned \$18,165 on average). Figure 1 reports the EITC schedule in 1990 for all families with children and Figure 2 reports the separate EITC schedules in 1996 for one-child and two-child families. The much higher maximum credit and the much wider range of incomes over which a substantial subsidy was received led to the sharply increased incentives to work. Over the six years starting in 1990, the maximum EITC credit rose from \$953 for all families to

¹This paper was also stimulated by results in Meyer and Brian H. Jenn (2000) which indicated that a generalized version of the standard structural labor supply model with fixed costs of work does not fit the labor supply patterns of single mothers over this period.

\$2,152 for families with one child and \$3,556 for those with two or more children. The sharply stronger incentives for families with two or more children began in 1994 and steadily increased through 1996. The EITC schedule was unchanged in real terms after 1996, but I include 1997 in the analysis period because past research has suggested a lagged effect of EITC changes.

To determine the relevance of different parts of the EITC schedule for different groups, I examined the earnings distribution of single mothers.² I expect that the EITC expansions will have their most pronounced participation effects on less educated single mothers who are most likely to have potential earnings on the phase-in or plateau regions of the EITC, where the proportionate increase in after-tax earnings due to the credit is the greatest. Among mothers with less than a high school degree, 45 percent had earnings in the phase-in region, and a total of 95 percent received some credit if they had two or more children. For those with more than a high school degree, the corresponding number were 14 percent and 65 percent.

Cuts in welfare, welfare waivers, and expansions of Medicaid had smaller but substantial positive effects on the financial incentives to work through 1996. Toward the end of the 1990 to 1997 period and accelerating after this period, welfare reform sharply increased the incentives to do some work. For many single mothers, welfare reform removed the possibility of receiving support without working. Receiving welfare benefits rather than working is most attractive to those with low skills, and thus, low earnings. Thus, welfare reform is expected to have smaller effects on high school graduates than high school dropouts, and even smaller effects on those with more than a high school education.

²The Current Population Survey data used here are described in Meyer and Rosenbaum (2001).

B. Incentives to Alter Weeks Worked and Hours Choices

The theoretical effects of the EITC expansions of the 1990s on hours and weeks worked depend on the parts of the schedule that are relevant to a particular person. The EITC expansions raised the phase-in subsidy rate from 14 percent in 1990 to 34 percent for one-child families and 40 percent for families with two or more children in 1996. However, since even the phase-in range for two-child families ended at \$8,890, this part of the schedule is mostly relevant for low-skilled mothers. Only 14 percent of those with more than a high school education earn less than \$8,890, and thus other parts of the schedule are much more important for these women. For the great majority of EITC recipients on the plateau region of the credit or the phase-out range, the standard labor supply model implies that the expansions of the 1990s reduced the incentive to work additional weeks and hours per week. The higher credit that was also received by more people had a negative income effect, implying decreased weeks and hours worked. Furthermore, the phase-out rate, an implicit tax on earnings, rose from 10 percent to just over 21 percent for those with two or more children and just under 16 percent for those with one child and applied to many more people after the credit expansions. This change also would be predicted to decrease hours worked. These plateau and phase-out disincentives have been a concern of researchers, policy makers, and a focus of policy simulations (Liebman, 2001).

To quantify the hours disincentives due to the EITC changes, I used the NBER TAXSIM program to calculate the mean change in the tax bill and the marginal tax rate between 1990 and 1996 for single mothers with different levels of education. For these calculations I assumed that the distribution of real earnings after 1990 conditional on working would be the same as that from 1984-1990. For those with a high school education or some college education, both after-

tax incomes and marginal tax rates rose. Using an income elasticity of 0.2 and a wage elasticity of 1.0 (slightly lower than the participation elasticity estimate in Meyer and Rosenbaum (2001) for work during the year and smaller than the implied elasticities in many of the other EITC papers), hours worked are predicted to decline between 1990 and 1996 by 1.7 percent for those with a high school degree and 2.8 percent for those with some college.

On the other hand, welfare reform, which had its main effects late in the sample period, removed for many single mothers the possibility of receiving support without working. We might expect an increase in weeks worked among those already working who spend some time on welfare, since it became harder to mix welfare for part of the year with work for part of the year. However, it also became harder to be on welfare and not work at least some hours during the year. A common finding is that those on welfare have observable and unobservable differences that make them likely to work few hours in the absence of welfare (see Robert Moffitt, 1983 for example). Those who prefer low work hours are likely to have been over-represented among those initially on welfare and not working who were induced to work by the EITC and welfare reform. The entry of these workers into the labor market would tend to reduce mean work intensity.

II. Employment Rate Changes

The EITC expansions and welfare reform had very large effects on the employment rates of single mothers. Table 1 reports the employment rates of single mothers and single childless women, by education and family size, by year for 1986-2000. Horizontal lines delimit the 1990 to 1997 period over which we expect the EITC to have its largest effects. The employment of

single mothers without a high school degree rose 22 percent between 1990 and 1997. Between 1986 and 2000, the employment of this group rose 60 percent. The employment of those with greater education rose also, but less sharply. Between 1990 and 1997 those with a high school degree saw their employment rise 8 percent, while over the full time period it rose 17 percent. The corresponding numbers for those with more than a high school education are 3 percent and 8 percent. During the same time periods, childless single women from each of these education groups had steady or declining employment. The patterns of employment by number of children reported in Table 1 also indicate strong effects of tax incentives on behavior at the extensive margin. The employment of those with two or more children did not rise any more than that for those with one child until 1994. From 1994 to 1996, however, when the two-child credit became relatively much larger, the employment of those with two or more children rose sharply. In more sophisticated examinations of the evidence, Eissa and Liebman (1996), David T. Ellwood (2000), Meyer and Rosenbaum (2000, 2001), V. Joseph Hotz, et al. (2001), and Jeffrey Grogger (2001) find large effects of the EITC on employment rates. It is clear that incentives have large effects on the work/non-work decision.

III. Weeks Worked and Hours Responses

Table 2 reports weeks worked conditional on working for single mothers and single childless women, by year for the 1986-2000 period. There was remarkably little change in weeks worked over this period. Weeks worked by mothers with a high school education were constant over the EITC expansion period of the 1990s, while weeks for those with more than a high school education appears to have risen very slightly. The changes in weeks for these groups of

single mothers are not in agreement with standard predictions. These predictions implied that weeks worked should have fallen in response to the adverse income and substitution effects of the EITC expansions among more educated single mothers.

Table 3 reports usual hours worked per week conditional on working for single mothers and single childless women over the 1986-2000 period. We see remarkably constant usual hours of work per week for single mothers. This constancy is also apparent for single women without children. Again, the lack of a decline in hours over the 1990 to 1997 period for those with a high school education, and those with greater than a high school education, is inconsistent with the predicted effects of the EITC.

IV. Possible Explanations for the Patterns

Could the lack of an apparent hours response to the tax incentives be due to other changes that counterbalanced the effects of the EITC? We examine several possible alternative explanations. First, could changes in wages have counteracted the forces for lower hours? Over the 1990-1997 period, real mean and median hourly earnings for single mothers and single childless women with a high school degree or more education declined slightly. Given the expectation that the uncompensated labor supply elasticity is positive, this change in wages adds to the puzzle rather than explains the lack of movement in weeks and hours.

Second, could the booming economy at the end of the EITC expansion period with its low unemployment rates have kept weeks and hours from falling? This story is unlikely, since 1989 and 1990 had the same aggregate unemployment rates as 1995 and 1996 yet weeks and hours were no lower in the latter years after the changed EITC incentives. Furthermore, single

childless women also should have been affected by the boom, if it had a substantial effect on hours, as they are in the same labor market and have very similar wages. However, their weeks worked and hours did not increase.

Third, other forces changing hours and weeks worked packages offered by employers could have kept these dimensions of work intensity from falling. However, in this case we would have expected weeks and hours for single childless women to increase, yet they do not show evidence of such omitted factors.

What, then, could have led to the unresponsiveness in hours and weeks worked? There are several possible explanations for the patterns. First, it is possible that single mothers do not understand the incentives provided by the EITC. There is evidence of incomplete knowledge of EITC marginal incentives in the intensive interviews with low-income families summarized in Jennifer L. Romich and Thomas Weisner (2000). However, it is hard to argue that the income effect would not be operable. Furthermore, it would be surprising if perceptions did not catch up with the EITC changes by 1997 and beyond.

Second, single mothers may be unable to choose weeks of work or hours on a job. The plausibility of this story is weakened by the high turnover rate frequently reported for this population. If matching of people to hours of work does not take place in this high turnover labor market, the likelihood of it occurring elsewhere seems low.

Finally, it is possible that increases in weeks and hours by those completely leaving welfare could have counterbalanced declines among those already working. It seems unlikely that this effect could have counterbalanced the effect of new workers having lower tastes for work, which would also tend to decrease weeks and hours worked. In Table 4, I report welfare

receipt rates and the fraction of single mothers that combined work in welfare over the 1986 to 2000 period to examine this issue in more detail. For the two higher educated groups, the fraction of single mothers combining work and welfare does not clearly fall below the early 1990s rate until 1999. Thus, a fall in the share of these low weeks and hours mothers is not the explanation for the lack of a decline in weeks and hours worked by these groups with a high school degree or more education.³ Furthermore, the fall in the fraction of single mothers receiving welfare is substantial, particularly for those with a high school degree. The entrance of these women into employment was expected to decrease mean weeks and hours worked among those working. Thus, it seems unlikely that changes in the welfare population could counterbalance the expected negative effects on weeks and hours.

V. Conclusions

A number of tentative conclusions can be drawn from these results. First, it appears that incentives which affect the labor supply of single mothers work almost exclusively through the participation margin. This result supports the modeling approach in Meyer and Rosenbaum (2001) which takes hours worked by the employed as fixed. Second, this result challenges us to determine what pattern of costs of work and what utility function shape might be consistent with nearly all of the labor supply response occurring on the participation margin. Alternatively, we may need to consider what type of constraints on hours and weeks choices should be incorporated in labor supply models. Third, policy simulations that do not recognize the

³I also examined the mean hours and weeks worked by those combining work and welfare. These numbers do rise by 1999, but the increase is small and late in the study period.

unresponsiveness of single mothers' labor supply on the intensive margin may give biased estimates. This criticism would seem to apply to Edgar K. Browning (1995), Michael Keane (1995), Stacy Dickert, et al. (1995), Liebman (2001), and others.⁴ Thus, the results suggest that the labor supply disincentives over the EITC phase-out range have been exaggerated and probably merit less concern by policy makers.

⁴The approach in Emmanuel Saez (forthcoming) is probably more realistic than earlier methods.

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Figure 1
1990 EITC Schedule for All Families with Children

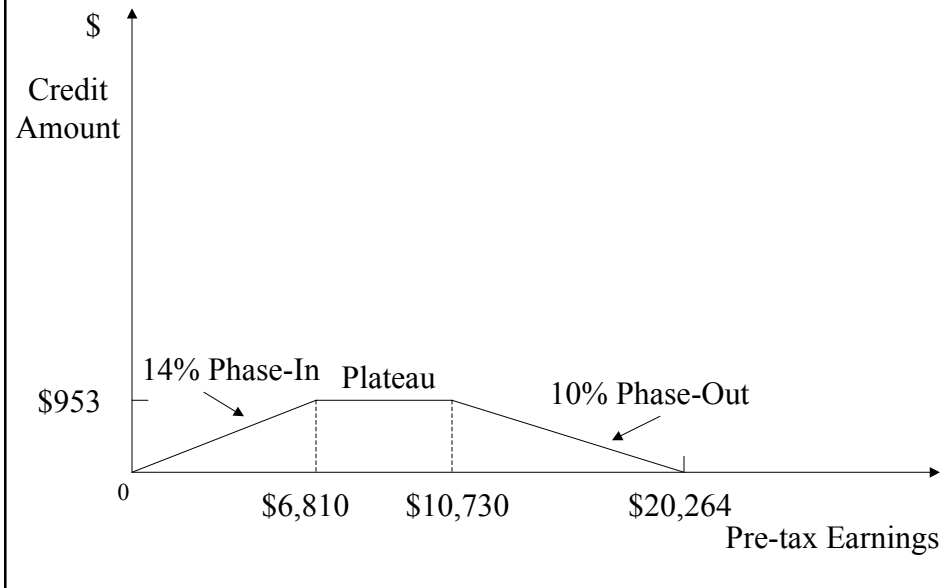


Figure 2
1996 EITC Schedules for One and Two-Child Families

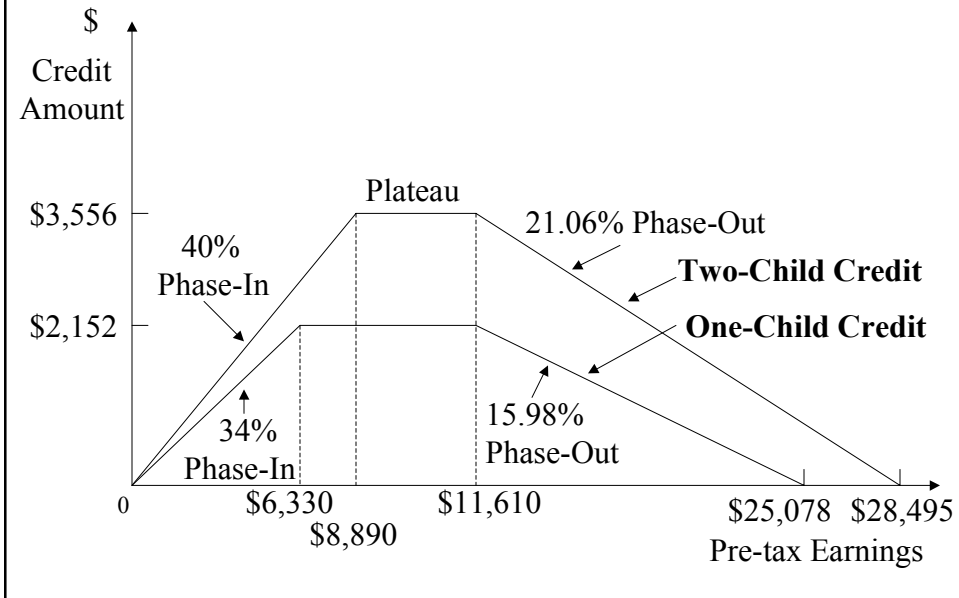


Table 1--Employment Rates of Single Mothers and Single Childless Women, by Education and Family Size, 1986-2000

Year	Less Than High School Degree		High School Graduates		More than High School		One Child	Two or more Children
	Mothers	Childless	Mothers	Childless	Mothers	Childless	Mothers	Mothers
1986	0.456	0.745	0.764	0.937	0.884	0.975	0.821	0.636
1987	0.442	0.743	0.783	0.935	0.892	0.981	0.812	0.660
1988	0.459	0.754	0.775	0.931	0.905	0.984	0.830	0.662
1989	0.479	0.719	0.788	0.924	0.896	0.980	0.839	0.670
1990	0.494	0.737	0.779	0.925	0.912	0.981	0.835	0.681
1991	0.464	0.720	0.752	0.920	0.907	0.980	0.817	0.668
1992	0.444	0.657	0.742	0.893	0.895	0.978	0.814	0.660
1993	0.472	0.709	0.755	0.907	0.883	0.973	0.853	0.649
1994	0.551	0.696	0.772	0.897	0.920	0.973	0.873	0.712
1995	0.558	0.718	0.799	0.895	0.924	0.977	0.870	0.744
1996	0.563	0.694	0.830	0.900	0.920	0.966	0.867	0.769
1997	0.605	0.691	0.840	0.914	0.936	0.971	0.873	0.807
1998	0.678	0.763	0.857	0.913	0.947	0.971	0.901	0.833
1999	0.741	0.739	0.899	0.924	0.949	0.977	0.924	0.867
2000	0.731	0.748	0.894	0.908	0.951	0.975	0.914	0.874
N	10,285	6,946	19,485	24,831	18,332	53,192	23,628	24,474

Notes: From the 1987-2001 March Current Population Surveys. Women are employed if they report working at all during the year. Sample includes those 19-44, except those in the armed forces, those who report positive earnings but zero hours of work, and those who report not working because they are in school, ill, or disabled.

Table 2--Weeks Worked in Year Conditional on Working, Single Mothers and Single Childless Women, 1986-2000

Year	High School Graduates		More than High School	
	Mothers	Childless	Mothers	Childless
	1986	43.39	47.71	47.64
1987	44.44	47.79	47.81	49.38
1988	44.28	48.17	47.27	49.69
1989	45.16	47.46	47.03	49.41
1990	44.43	47.90	46.97	49.04
1991	44.79	47.40	47.75	49.14
1992	44.55	47.39	46.56	48.84
1993	43.62	46.76	47.00	48.88
1994	44.16	47.48	47.29	48.97
1995	44.71	47.46	47.61	49.45
1996	44.32	46.81	47.31	49.38
1997	44.92	47.91	47.84	49.53
1998	45.05	47.37	47.72	49.47
1999	45.55	47.51	48.21	49.71
2000	46.86	47.94	48.85	49.82
N	15,552	22,755	16,782	51,889

Notes: See table 1.

Table 3--Usual Hours Worked Per Week Conditional on Working, Single Mothers and Single Childless Women, 1986-2000

Year	High School Graduates		More than High School	
	Mothers	Childless	Mothers	Childless
	1986	37.26	38.92	38.67
1987	37.97	38.64	39.52	38.35
1988	37.45	38.88	38.94	38.54
1989	39.02	39.16	39.73	39.09
1990	38.15	38.90	39.28	38.77
1991	37.76	38.72	39.32	38.42
1992	37.10	38.77	38.97	38.32
1993	37.36	38.41	38.41	38.47
1994	37.53	38.59	39.13	38.54
1995	37.94	38.02	39.52	39.31
1996	37.24	38.57	38.76	38.71
1997	37.92	38.18	38.98	38.71
1998	38.01	38.79	39.19	38.79
1999	38.34	39.33	39.15	39.46
2000	38.15	38.63	39.50	38.87
N	15,552	22,755	16,782	51,889

Notes: See table 1.

Table 4--Welfare Receipt Rates and Fraction of Single Mothers Combining Welfare and Work During Year, 1986-2000

Year	High School Graduates		More than High School	
	Welfare and Work		Welfare and Work	
	1986	0.294	0.123	0.149
1987	0.286	0.131	0.108	0.049
1988	0.281	0.114	0.129	0.068
1989	0.246	0.099	0.128	0.061
1990	0.285	0.138	0.113	0.055
1991	0.301	0.113	0.112	0.059
1992	0.299	0.116	0.143	0.086
1993	0.317	0.138	0.166	0.089
1994	0.295	0.142	0.141	0.087
1995	0.248	0.121	0.125	0.081
1996	0.221	0.121	0.131	0.097
1997	0.182	0.099	0.096	0.074
1998	0.173	0.113	0.077	0.058
1999	0.112	0.086	0.063	0.048
2000	0.097	0.065	0.050	0.039
N	19,485	19,485	18,332	18,332

Notes: See table 1.