The EITC and Labor Supply: Evidence from a Regression Kink Design

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April 2013

Abstract: This paper examines the response of workers, in terms of hours worked, to the Earned Income Tax Credit (EITC). Several studies have consistently found that receipt of the EITC induces single women with dependent children to enter the labor market. These same studies, however, did not find the expected negative impact of EITC receipt on number of hours worked by single mothers already in the labor market. The possibility exists that this lack of finding is due to the methodology used in these studies. Employing a regression kink design, I exploit the discontinuities in the EITC benefit function to examine single mothers' hours of work. Using 13 years of the CPS, with 9 of those years linked to IRS data, I examine single mothers whose earned income entitled them to a credit; in particular, I compare those just before a kink to those just after the kink under the assumption that these two groups of women will be similar on observed and unobserved characteristics. I find that mothers who face a high implicit tax induced by the EITC's design reduce their hours of work. However, results are robust only for women with more than one child.

Keywords: EITC, labor supply, single mothers

JEL classification: H2; J1; J2; J22; J32

*This paper is released to inform interested parties of ongoing research and to encourage discussion of work in progress. The views expressed on technical, statistical, or methodological issues are those of the author and not necessarily those of the Census Bureau. I thank Matthew Freedman, Daniel Lichter, Francine Blau, and Matthew Sweeney for their generous assistance, and the participants of Research in Progress in the Department of Policy Analysis and Management and the Labor Economics Seminar at Cornell University for their support and advice. I also thank Dan Feenberg at NBER for his generous assistance with TAXSIM. Any errors are my own.

1 Introduction

This paper estimates the effect of the federal Earned Income Tax Credit (EITC), the largest cash-transfer program in the United States, on the labor supply of single mothers at the intensive margin (specifically, hours worked). Economic theory predicts that the provision of an EITC should induce labor force participation (the extensive margin) of single mothers, and previous research has documented this relationship (Eissa and Hoynes, 2006; Meyer and Rosenbaum, 2001). The EITC is theorized to have an ambiguous effect on hours worked depending on where a worker's income places him or her along the benefit function. When the credit is increasing as a function of earned income, hours may increase or decrease; and at points where the credit plateaus or decreases, hours are predicted to decrease (Eissa and Liebman, 1996; Eissa and Hoynes, 2006).

So far, studies have not found convincing evidence in support of the theory described above. Previous work has focused on discerning the intensive response by using increases in EITC generosity as a source of identification (Eissa and Liebman, 1996; Eissa and Hoynes, 2006), or by exploiting the variation in state tax structure, including state-specific EITCs (Meyer and Rosenbaum, 2001). Many studies rely on a difference-in-differences approach, using single women without children as a "control" for single mothers, or single mothers with one child as a "control" for those with more than one. These methods rely on the fact that single women receive different levels of benefit depending on their family structure; those with more chidren receive a higher benefit.

Eissa and Hoynes sum up the apparent lack of hours response by stating: "A consistent and somewhat puzzling finding in the empirical literature on the EITC and labor supply is the large response of the participation decision and the lack of any response in the reported hours worked by taxpayers in the labor force" (Eissa and Hoynes, 2006, p. 102). They offer several explanations: the hours worked elasticity is simply too small to discern; workers are unable to choose their hours but rather rely on institutional norms or employer expectations; or, workers are unaware of the structure of the EITC.

In the work presented in this paper, I rely on the discontinuity in the EITC benefit function to discern an hours worked response. The research design is well suited to the question, and constitutes an improvement over previous research since it permits comparison of female workers within the same group (those with one child or more than one child), rather than relying on a comparison between groups. The analysis also relies on workers' updating their information and on the time-order of questions on income, earnings, and hours worked asked in the March Supplement to the Current Population Survey (CPS). (Information on earnings and income are enhanced using tax-year earnings from IRS data.) Chetty and Saez (2009) discuss the assumption made in the literature on tax and transfer policy that individuals are fully informed about the structure of these policies, and that they use this information in making choices. They test this knowledge by running an experiment on H&R Block clients. Tax professionals who provided their clients with information on the structure of the EITC induced their clients to increase their earnings, and thus their EITC refund, in the next period. Similarly, the analysis presented here relies on workers updating their understanding of the EITC upon doing their taxes.

The mechanism being investigated is thus different from standard labor supply analyses that attempt to estimate substitution and income effects. These analyses presume foreknowledge of credit receipt on the part of workers that permits them to make a simultaneous earnings and hours decision. Yet the overwhelming majority of taxpayers have imprecise information about the EITC, and they receive the credit as a lump sum at one point in time. In other words, the likelihood is small that workers know enough about the credit to treat it as a wage subsidy and to adjust their hours simultaneously with their earning the credit. On the other hand, by looking at hours worked around the time that these same workers are filing their taxes (in other words, when their own EITC benefit becomes known to them), an hours-worked response to the EITC may be discerned.

The present study is also an improvement over earlier analyses in that it uses, for 75 percent of the sample under consideration, actual earnings reported on tax filings rather than CPS-reported earnings (which are subject to reporting error (Bollinger, 1998)). Use of administrative records for earnings and adjusted gross income improves the accuracy of the sorting of earners on either side of the kink points in the EITC benefit function, a necessary condition for the regression kink design.

The results of this analysis indicate that single mothers with more than one child reduce the number of hours that they work when their income in the preceding period places them immediately after the kink in the EITC benefit function where the benefit begins to decrease. This effect is statistically significant but economically small. I also find a similar effect for mothers with one child, but the effect is not as robust. This is likely due to other elements of tax and transfer policy that cloud the perception of loss at this point. I find no effect at the kink where earners enter the plateau region.

The paper is organized as follows: In section 2, I present background on the EITC and previous research pertaining to its effect on the labor supply of single mothers. Section 3 covers the regression kink design, its applicability to my research question, and the identification strategy and assumptions used in the analysis. Section 4 describes the data, including a discussion of record linkage and density and covariate tests. The main results are presented in section 5, and robustness checks pertaining to those results in section 6. Section 7 suggests some policy implications and concludes the paper.

2 EITC Background and Previous Research

2.1 Background

The EITC was instituted in 1975 and underwent major changes over the years, particularly in 1993 in coordination with welfare reform. It is a refundable credit, meaning that it provides a credit to taxpayers even if they have no federal tax liability. Taxpayers are eligible for the credit if they earned a wage and salary income over the last year and are under a certain maximum of total income. Other rules for eligibility pertain to a limit on investment income and a residency requirement for dependent children. A negligible credit is available to workers without children; workers with qualifying children are eligible for credits that in some cases represent a large fraction of income.

Figure 1 shows the structure of the EITC as a function of earnings for single tax filers with eligible dependents.[1] The upper line in the figure shows the benefit structure for those with two or more children, and the lower line the benefit for those with one child. Eligible dependents include children younger than 19, or younger than 24 and a full-time student. For each category of family, the shape of the benefit function is the same, but the level of benefit is substantially higher for those with two or more dependents com-

[1] Figure 1 is adapted from a similar figure in Meyer (2002).

pared to thoses with one. The EITC exhibited the structure shown in Figure 1 from 1996 to 2008. Beginning in 2009, a higher level of EITC generosity was legislated for women with three or more children.

As in the figure, in 2008, upon earning income greater than 0, a working mother with one child receives a credit of 34 percent of earned income up to a maximum credit of $2917, which occurs at earnings of $8580 (the phase-in region). She then enters the plateau region, over which she receives $2917 in EITC regardless of how much more she earns. At an earned income of $15,740, she then faces a decreasing credit equal to the maximum credit minus 15.98 percent of income, until the credit is completely phased out at income of $33,995. For women with two or more children, the maximum credit is $4824 (at $12,060 in earnings), the phaseout income is $15,740 and the phase-out rate is 21 percent, with final eligible earnings of $38,646.[2]

Since its introduction, many states have also adopted EITCs, most of which are a percentage of the federal EITC. The majority of these are quite small, representing between 3 percent and 5 percent of the federal credit.

The EITC is hypothesized to induce work among single mothers not currently in the workforce. For those already in the workforce, the effect of the credit on hours worked depends on which region of the credit a worker's earnings puts her.

Figure 2 shows simplified versions of the EITC with indifference curves drawn to demonstrate the hypothesized effect of the credit on labor supply.[3] Each panel shows a diagonal line that represents the worker's original budget constraint, with leisure a normal good with a value of 0 hours at the origin. The addition of the EITC benefit yields a new budget constraint. First, it is clear from each panel that the benefit provides at least as much income as before for every choice of hours. The credit increases the hourly wage of each worker. In standard labor-supply analysis, a worker's hourly wage is the hourly price of her "leisure."[4] When her wage rate increases, she substitutes away from leisure since leisure is now relatively more expensive (the "substitution effect"). However, if

[2]Liebman (1998) discusses the history of the EITC at length. Its shape is largely due to expansions and compromise legislation that appear to be uncoordinated with other tax and transfer programs. The plateau region, for example, resulted from a compromise expansion in the program that occurred in 1979.

[3]Figure 2 is adapted and simplified from similar figures in Hoffman and Seldman (2003).

[4]I put "leisure" in quotation marks because it is a catchall phrase for activities other than paid work. Taking care of children and households are more likely to be the activities undertaken by this sample of women.

leisure is a normal good, an increase in income results in more consumption of leisure (the "income effect").

Each panel shows the interaction of income and substitution effects and their theoretical impact on hours worked. The panel on the left shows the case for the area of increasing benefit. In the absence of the EITC, the worker chooses a, with hours of work H_a. The substitution effect appears as a movement from a to a' along the income-compensated (dotted) budget line. The income effect–the vertical distance between the income-compensated line and the new budget constraint–causes hours to decrease to b. Note that, depending on the sizes of the income and substitution effects, hours could decrease or increase in this case.

The middle panel shows the case when the worker's earnings place her in the plateau region. Here, the two budget lines are parallel, and only an income effect exists (since the credit is constant over this region regardless of further hours worked). Hours are predicted to decrease, from H_a to H_b.

Finally, the last panel shows the case when earnings place the worker in the region of decreasing benefit. The worker still receives more income from the credit, but for every further hour worked, her wage decreases, making leisure less expensive. Hours are predicted unambiguously to decrease.

2.2 Previous Research

Empirical studies of the EITC have consistently found that the credit increases labor force participation of single mothers at the extensive margin (meaning any participation in the labor force). Eissa and Liebman (1996) used the expansion in the EITC in 1986 to estimate the labor supply response of single women with children. They employed a difference-in-differences approach to compare women without children and those with children before and after the policy change. They found that labor force participation rates went up for women with children by about 2.8 percentage points compared with women without children, with higher participation rates for women with less than a high school education. They found no evidence that the EITC decreased hours of work for women already in the labor force.

Meyer and Rosenbaum (2001) analyzed the EITC in the larger context of welfare reform, comparing the effects of the EITC in tandem with welfare and Medicaid receipt and state and federal tax changes. They found that the 1996 expansion of the EITC and other tax changes accounted for the larger share of increase in labor force participation by single mothers, with welfare changes accounting for a smaller share. Specifically, they find that the weekly employment of single mothers with one child relative to women without a child rose 7.1 percentage points between 1984 and 1996, a difference they attribute largely to the EITC.

In a study of California welfare recipients, Hotz and Scholz (2006) found a similar employment effect of an expansion of the EITC. As in Eissa and Liebman (1996), the authors use the greater generosity of the EITC for those with more than one child to distinguish the effect of the credit.

In the foregoing studies, no convincing evidence of an intensive margin effect was found for this population; one explanation for this is that the single mothers in question might not have been aware of the EITC's structure, and thus could not take EITC receipt into account as though it were a wage subsidy. A requirement for a simultaneous earnings/hours decision in the presence of a wage subsidy is that the subsidy be known.

In a study using H&R Block offices, Chetty and Saez (2009) found that clients who were given information about the structure of the EITC when their taxes were being prepared increased their EITC in the next tax year. The effect, however, occurred among filers who were clients of so-called "compliers"–tax preparers who informed clients how to maximize their EITC. Clients of "non-complying" tax preparers maximized earnings, even when those earnings placed them in the phase-out region of the EITC schedule. Chetty and Saez (2009) conclude from their study that the intensive-margin labor supply response to the EITC is attenuated by a lack of information.

Similar to Chetty and Saez (2009), this analysis relies on the belief that workers change their behavior due to new information: namely, that those who find that their earnings have put them immediately beyond the plateau area of the EITC in one period might respond by decreasing hours of work in the next period. Unlike Chetty and Saez (2009), I am not able to observe the kind of information that workers receive when they file their taxes. However, previous research on how much people know about the

EITC supports the assumption that at least some workers will become informed about it through tax filing (Maag, 2005). Thus, this paper contributes to the discussion by merging two strands of inquiry into the EITC, using new research on how people update their information about the EITC to help shed light on an older question regarding intensive labor supply.

3 Research design

3.1 Method

The regression kink design (RKD) is a relatively new method and little exists in the way of its application. [5] Many of the theoretical issues applicable to regression discontinuity (RD) designs also apply to this method. Because it relies on kinks (rather than jumps) in an otherwise-continuous policy variable that assigns a treatment, the EITC is particularly well-suited to this type of analysis. As in RD designs, kinks in the policy assign observations to one treatment or another in a manner that is (or a least should be) as good as random. Card et al. (2009) formalized the design, relating it to regression discontinuity and providing formal proofs for the circumstances under which it can be used. The authors also connected the two strategies in terms of necessary tests and robustness checks, which are outlined by Lee and Lemieux (2010). I adopt these strategies in this analysis.

The regression kink design relies on a regressor (such as a policy variable) that is a deterministic function of a "behaviorally endogenous variable" that cannot be replaced by a plausible instrument (because the outcome of interest is also associated behaviorally) (Card et al., 2009). The EITC benefit is determined by a worker's earned income, and thus earnings and EITC receipt are together related behaviorally to hours of work. Thus no instrument exists for EITC receipt that can satisfy the independence assumption. However, because there are kinks in the benefit function, these can be exploited.

The process is related to RD designs in that a function, earnings, determines the EITC benefit received, and it is continuous everywhere except at two points. For a researcher or policymaker, these discontinuities are known; for workers, precise foreknowledge of

[5] Some other examples of RKD's include Guryan (2001), who used kinks in state education aid formulas as instruments to look at the effect of public school spending. Nielsen et al. (2010) used a kinked aid scheme to study the impact of direct costs on college enrollment.

where the kinks occur is unlikely and can be tested. Earners are therefore assigned to either side of the kink "as good as randomly," and earners immediately before and after the kink should look the same on all covariates. Unlike RD designs, the EITC function does not determine whether or not a treatment is given. Rather, the slope of the treatment function changes at a kink point.

To put it more formally: assume that Y is the number of hours worked per year in year $t+1$, V is earnings in year t, and B is the EITC, which is a deterministic function of V with a kink at $v = 0$. A simple formulation would be

$$Y = \tau B + g(V) + \epsilon, \tag{1}$$

where $g(V)$ is a continuous function expressing earnings. $B = b(V)$, and is a deterministic function of V continuous everywhere except for a kink at $v = 0$. Then τ can be estimated using the "RKD estimand":

$$\tau = \frac{\lim_{v \to 0^+} \frac{\partial E[Y|V=v]}{\partial v} - \lim_{v \to 0^-} \frac{\partial E[Y|V=v]}{\partial v}}{\lim_{v \to 0^+} \frac{\partial b(v)}{\partial v} - \lim_{v \to 0^-} \frac{\partial b(v)}{\partial v}} \tag{2}$$

In words, the coefficient of interest, τ, is the change in slope in the conditional expectation of Y (hours worked) at a point given by v, divided by the change in slope of the benefit function (the change in the EITC at the kink point). Econometrically, the numerator can be estimated using the following model:

$$E[Y|V=v] = \alpha_0 + \sum_{p=1}^{p} [\alpha_p (v-k)^p + \beta_p (v-k)^p * D], \tag{3}$$

where $|v - k| \leq h$, and h is the bandwidth chosen. In this case, k is the kink point in question. The α's and β's are the coefficients on the polynomial terms (and, after considering higher polynomial orders, p ranges from 1 to 3). The numerator of the RKD estimand is the coefficient β_1. The denominator is the derivative of the benefit function at the kink, which is a simple mathematical calculation. The estimand can be considered the "treatment on the treated" (TT) effect as from a randomized experiment, as long as certain conditions are met regarding the distribution of all other pre-determined factors (Card et al. (2009)).

The effect I am able to estimate is the intent-to-treat. In the CPS, participants are specifically asked a number of tax-related questions regarding earnings and other sources of income. They are not specifically asked about their EITC filings or receipt; rather, the tax questions they respond to are used to model EITC eligibility and the value of the credit. For a subset of my CPS observations, those in years 2005 to 2008, I have information on EITC receipt from a file provided by the IRS. Using this subset, I estimate EITC receipt over the bandwidths used for the hours estimate, allowing me to partially identify a treatment on the treated effect.

3.2 Identification

For this research design to be feasible, some assumptions about workers' and tax filers' behavior must be met. First, workers may not know the exact benefit structure of the EITC until they work on their taxes. Over the tax year in question, precise knowledge of kink points may allow workers to change their behavior, leading to bunching at kink points. For workers who are not self-employed, this foreknowledge is unlikely, since changes in the kink points occur each year as the benefit is adjusted using the Consumer Price Index. Even if they received the EITC in an earlier year, as long as workers cannot precisely assign themselves to a preferred position on the benefit function, this assumption is not violated (Lee and Lemieux, 2010).

Second, filers must gain knowledge of where their preceding year's earnings have placed them on the benefit function, and they must learn this information by March of the next year, when the survey is administered. This requires that some proportion of taxpayers does their taxes by March. Scholz (1994) found that more than half of all federal tax returns are filed between January and March, and expectation of a refund is associated with earlier filing. This provides some evidence that a respectable portion of the sample either files in time for the March survey, or at least have their tax calculations underway.

Finally, filers must become aware of the fact that a given level of earnings has placed them along a portion of the EITC benefit function that they consider undesirable, causing them to update their information and change their behavior. It is not necessary that filers learn the specific shape of the EITC in order to receive information that may cause them to update: Figure 3 shows the EITC schedule as taxpayers see it. A single mother with two children who earns $15,750 in 2008 may look at the schedule and immediately see that she is just beyond receipt of the maximum benefit. In this information updating, the role of tax preparers is uncertain. Maag (2005) provides evidence that low-income earners report "hearing of" the EITC more often if they do their own taxes, but the difference between this group and those who use tax preparers is small (72% of those doing their own taxes have heard about the EITC compared with 69% of those who use tax preparers).

As in a regression discontinuity design, all other covariates must be smooth in relation to the kink points in the EITC. Of particular importance for this situation are other tax and transfer programs that may change in close proximity to the EITC's kinks or may themselves be governed by rules similar to those that govern the level of EITC receipt.

4 Data

4.1 Data sources, sample, and measures

The data used in this paper are the March Supplements to the CPS, a nationally representative study of about 60,000 households. These data are supplemented with IRS data from 1040 filings, matched on individuals. In the survey, participants are asked detailed questions regarding hours worked in the last week at all jobs, as well as information on earnings and weeks worked in the year immediately preceding the survey. Thus, tax data from the year prior to the survey is matched to the survey respondents.

Survey years included are 1997 to 2009. Due to the question structure of the CPS, using these years means including income, earnings, and tax information from 1996 to 2008, a time period over which EITC generosity remained the same in real terms for single parents. For every year, I create a variable that reflects earned income in 2008 dollars, and determine at what value of real earned income a kink in the benefit function occurs. For 2000 to 2008, and for earners who filed a 1040 in the year preceding the survey, 1040 data is available. In these cases, true earnings, adjusted gross income, and interest income from the 1040 file supersedes CPS values. Moreover, for tax years 2005 to 2008, data on receipt of the EITC is available from a special IRS file used by the Census Bureau to calculate EITC take-up rates. IRS and CPS data are linked using a procedure, outlined in detail in Plueger (2009), in which individuals are matched to a master reference file based on combinations of social security number, name, date of birth, and address. The quality of the match on a year-by-year basis for the CPS ranges from 80% for early years to 91% in 2008.

Because the issue of interest is eligibility for the EITC rather than its take-up, no observations were dropped if they were missing IRS data. For years when tax data is available, it was necessary to continue using CPS earnings for those who do not file taxes. There are also years when no tax data are available; observations from these years are retained as well. Limiting the sample only to those years for which tax data were available led to results that were similar to those described in the results section, but with a loss of power due to the smaller sample size (results available upon request). Because observations who have IRS data may be different from those without it, I use the probability of having tax data as a covariate in the analysis.

The dependent variable of interest is number of hours worked at all jobs per week, multiplied by the number of weeks worked in the preceding year (for ease of interpretation).[6] The questions asked regarding earnings and hours are crucial to the story being told in this analysis. Respondents are asked how many hours per week they usually work at all jobs at the time of the survey. In other words, for a given year of the March CPS, hours of work are applicable to March of that year. Earnings, income, and all other tax-related variables are asked for the year immediately preceding.[7]

I limit the analysis to single women between the ages of 16 and 49 who were eligible for the EITC. Women were included if they had one or more children, had positive hours of work at the time of the survey, and reported positive earned income for the preceding year. Women were excluded if they reported zero hours of work or zero earnings, or if they reported being a full-time student. Women were also excluded if their investment income or adjusted gross income in the preceding year made them ineligible for the EITC. Finally, self-employed women were excluded, since there is an inducement for them to manipulate their earnings to where the EITC is maximized (and there is evi-

[6]Single mothers receiving the EITC may also respond in the number of weeks worked. To try to overcome this potential endogeneity, I used the mean and the median for all single mothers as the multiplier. The results were qualitatively similar.

[7]The following question was asked in March 2009 regarding earnings: "How much did (name/you) earn from this employer before taxes and other deductions during 2008?"

dence that they do so (Saez, 2010)).

The benefit parameters of the EITC vary based on number of children, with women with one child receiving less per dollar earned over the entire benefit function compared with women with more than one child.[8] Because the treatments are different, I split the sample into two groups: women with one eligible child and women with more than one. There is precedent for treating the groups separately due to the greater generosity of the credit for those with more than one child. Meyer and Rosenbaum (2001), for example, compared single mothers with one child to single mothers with more than one in a difference-in-differences design. As a robustness check, I also run the analysis on women without children. The number of eligible children was calculated using an IRS/Census Bureau EITC eligibility model, which employs variables on household structure, parent identifiers, and detailed relationships to determine child credits for families. [9] Dependents who meet certain age and status requirements were counted as eligible children for both the EITC and other tax variables used as covariates.

The analysis is performed for the two groups within different bandwidths of the assignment variable, earnings, around two kinks in the benefit function: the "first" kink, where earners leave the area of increasing benefit and enter the plateau; and the "second" kink, where earners leave the plateau and enter the area of decreasing benefit.[10] The bandwidth choices for each group are also constrained by the rules of the benefit function, since a bandwidth that includes observations too close to the non-relevant kink might induce bias. Bandwidths of $1000 and $2000, in 2008 dollars, were chosen for both groups. Then, since the plateau region is "wider" for women with one child compared to those with more than one, a bandwidth of $3000 was also used for this group.[11]

[8] In 2009, the benefit structure was changed to give a larger benefit to single parents with three or more children, creating three levels of benefits for single parents with any children.

[9] The modeling links a child to the survey reference person based on 1) the reference person being a child's parent; 2) the reference person being an adult relative of the child; or 3) the child being identified as a fosther child. Earnings, income, and child age and student status are applied both to link only qualifying children and to determine overall eligibility. The IRS data include variables on number of dependents, but these do not have the age and residence information necessary to determine EITC-eligible children.

[10] I could also have considered the kink where earners have left the benefit entirely to see if their hours decrease in the next period. The marginal benefit from making this choice at this level of earnings, however, is vanishingly small. Earners would have to reduce their hours substantially before gaining back in EITC what they would lose in earnings from the foregone hours.

[11] Bandwidth choice was tested using a variety of tests suggested in Lee and Lemieux (2010). Bandwidth was originally chosen largely because of the constraints in the benefit formula, which leave ranges in the earnings function where a "kink" could be considered applicable. Once chosen, bandwidths were weighed against one another using a "leave one out" approach described by Lee and Lemieux (2010),

The regression kink design, as with regression discontinuity, relies on the smoothness of covariates in relation to the forcing variable. Likely the most important covariates to check in this case involve the entire tax burden and transfer benefit that a mother in the sample faces. Because the EITC is only part of a package of burdens and credits, and because tax burden will vary by year and state, two concerns are paramount: that the overall tax burden doesn't change abruptly at the same level of income as does the EITC; and that no other credit or benefit uses the same income cutoffs to determine eligibility. Unfortunately, the IRS-provided data did not include information on federal taxes owed by filers or on the eligibility for credits. NBER's TAXSIM program (for details, see Feenberg and Coutts (1992)) was used to generate federal and state marginal tax rates and the child tax credit, again using CPS earnings, income, and dependency variables superseded by IRS values when available.

Other covariates in the CPS include attributes that likely influence both hours of work and earnings, such as age, age of youngest child, race, education, and number of children. Table 1 provides summary statistics for the covariates considered in the analysis for each group and bandwidth.

4.2 Density and covariate tests

Best practices for regression discontinuity designs, outlined by McCrary (2008) and summarized by Lee and Lemieux (2010), require an examination of the density of the assignment variable to ensure that no one is "gaming" the system, but that assignment to one side of a cutoff or the other is as good as random. The most straightforward way to check that this requirement is met is an examination of the histogram of earnings to see if observations are bunched up immediately before a kink point. Figure 4 and Figure 5 show histograms of earnings for the two groups of single mothers within \$2000 (scaled

via Imbens and Kalyanaramang (2009), which chooses the bandwidth with the lowest squared error between predicted and true values of the outcome variable. Further, a more objective "rule of thumb" test for a rectangular kernel was run for women with more than one child at the second kink:

$$h_{ROT} = 2.702 \cdot \left(\tilde{\sigma}^2 R / \sum_{i=1}^{N} [\tilde{m}''(x_i)]^2 \right)^{1/5}$$

where m'' is the second derivative of an estimated regression of hours on earnings, σ is the estimated standard error of the regression, and R is the range of earnings. A relevant range of earnings was selected for this group, beginning at the first kink and ending at the point where the EITC credit goes to 0. The test calculated \$1360 as the optimal bandwidth.

to real 2008 dollars) on either side of each kink point. There is evidence of some heaping (rounding) in the assignment variable at certain values due to the inclusion of CPS earnings for non-filers, but no evidence of bunching before a kink that occurs independent of this heaping. Since attributes of workers who round earnings may influence the dependent variable, leading to biased estimates, I check for this by employing a test suggested by Barreca et al. (2010), described later.

A further requirement is that no covariates display kinks that correspond to the kink in the benefit function, which would indicate bias. This can be tested visually by looking at the distribution of covariates over bins of earnings.[12] While many covariates were tested in this manner–including demographic characteristics such as age and race–the graphs included here are limited to those tax and benefit variables that seemed the most likely to confound the situation. These include state marginal tax, federal tax burden before credits, Temporary Assistance to Needy Families (TANF) and Supplemental Nutrition Assistance Program (SNAP) receipt, and Supplemental Security Income. I also examined whether the probability of having tax data changes over the kink points. Even-numbered Figures 6 through 16 display the graphs for these variables at each kink for women with one child; the odd-numbered figures show the same for women with more than one child. For the sake of simplicity, only one bandwidth choice is shown: $2000 on either side of the kink under consideration.

Tax variables were calculated using the NBER's TAXSIM program. The CPS also includes modeled values for federal taxes and state taxes, as well as later years of the child tax credit. These values, however, are based on the earnings variable in the CPS, and thus are not particularly informative regarding tax burden for the sample generated using the linked data.

First, there is a sharp increase shortly before the second kink in federal income tax burden for women with one child. This sharp increase occurs because women with one child (assuming one exemption and one dependent) begin paying federal income tax once their total income is above $15,000 in 2008 dollars. Thus, for women with one child, federal income tax liability amounting to 10 percent of taxable income kicks in shortly before the kink in the EITC where the benefit begins to decrease. Therefore, using this

[12]The choice of bin size ($100 wide in real terms) was confirmed using a "bin test" prescribed by Lee and Lemieux (2010), which was ultimately agnostic within the $2000 bandwidth regarding bin widths of $200, $100, $50, or $25.

research design, it is likely impossible to disentangle a response to payment of federal tax with a response to the decrease in the EITC. For women with more than one child, the extra dependent exemption means that total income begins to be taxed at $18,500, which is outside the earnings range under consideration. In looking at the graph, there are clearly women in the sample who have a small federal tax liability, which could be due to other taxable income besides earnings. However, the pattern of tax burden does not change at the kink.

Receipt of the child tax credit appears not to differ for mothers with more than one child for either kink. For women with one child, there appears to be a steady increase in the Child Tax Credit that starts shortly before the second kink. State marginal tax rates appear to jump discontinuously at the first kink for both groups (but there appears to be no change in slope); for both groups at the second kink, state marginal tax rates appear to increase smoothly.

In summary, a visual inspection of the covariates indicates that at the first kink for both groups, and at the second kink for the group with only one child, there exist covariates that may not meet the continuity requirements of the regression kink design. For women with more than one child whose earnings place them near the second kink, all covariates appear to be smooth. However, this will be tested formally.

5 Results

5.1 Graphs of benefit/hours relationship

For the sake of simplicity, I show graphs of the benefit-hours relationship for one bandwidth choice: $2000 on either side of each kink. Figures 20 and 21 show the average number of hours worked per year as a function of income for women with one child at the first and second kink, respectively. Hours were binned over 40 equal-sized intervals of income (within the range of income that leaves one eligible for the EITC), and average hours are plotted for each bin. In both cases, upon visual inspection there appears to be no change in slope on either side of the kink, but this will be examined econometrically.

Figures 22 and 23 show the same graphs for women with more than one child. At the first kink, there is evidence of a slight change in slope, but it occurs well beyond the actual kink point. At the second kink, an abrupt change of slope occurs immediately at the kink point, although hours worked does appear to recover $1000 beyond the kink.

5.2 Tables of results

Table 2 shows the results of estimating a change in hours at the first kink. The odd-numbered equations are parsimonious regressions using only the slope terms. Even-numbered equations include year fixed effects. Although there is a (marginally) significant estimate within the largest bandwidth and third-order polynomial for single mothers with one child, these results disappear upon the addition of covariates. Moreover, the statistically significant estimates passed none of the robustness checks described below.

Table 3 shows the results at the second kink. For women with one child, the results also show no change in behavior, except in the largest bandwidth and first polynomial order. For women with more than one child, results are more convincing. Using a bandwidth of $1000, estimates of the change in slope are significant for both the second- and third-order-polynomial model (in the latter case, when year fixed effects are included). Using the $2000 bandwidth, results are significant for the third-order models. In all cases the coefficient has the same, and "expected," sign (that is, hours appear to decrease). Looking at the fit statistic (BIC) for each case indicates that the second or third order is preferred in the smaller bandwidth (since the statistic is smaller), and the third in the larger. However, the difference in BIC statistics is quite small among the three orders. These estimates suggest that women who are eligible for a credit just beyond the kink point respond by decreasing their reported hours of work by between .5 and 1 hour per year. Further robustness checks indicate that the third-order polynomial model in the larger bandwidth fits the data best, with the second order in the smaller bandwidth the second-most preferred.

Taking this estimate (an intent to treat effect) to be approximately -0.5 hours per year, and assuming that all single mothers who are eligible for the EITC are correctly sorted to the treatment and receive it, a treatment on the treated effect would be $-0.5 * 4.75$, or approximately -2.4 hours per year. (The TT estimate, or RKD estimand, is β_1 divided by the derivative of the benefit function at the kink, 21.06%). However, not all mothers who are eligible for the credit are both correctly sorted to the treatment and receive the credit.

The estimate of a "fuzzy" RKD would include an estimate of the change in the benefit function using the data. I have data on EITC receipt only for 2005 to 2008. Using these years led to noisy estimates of the change in slope of the benefit at the kink point due to the small number of observations. Rough estimates indicate a treatment on the treated effect of anywhere between -0.7 and -0.2 hours per year, an extremely small effect.

Further polynomial orders were attempted, but adding more terms did not improve the Schwartz statistic for the fourth or fifth polynomial specification, and by the fourth order, terms began to drop due to multicolinearity. I also used the CPS person weights to see if results were different when the regressions were weighted. All results were nearly identical to the unweighted regression results.

The remaining analysis proceeds on the second kink alone. Table 4 shows the results with the inclusion of the covariates, including race, age, education, number of dependents (for mothers with more than one), age of youngest child, and the tax and benefit variables described in section 4.2. The odd-numbered equations show the results with the covariates included in the parsimonious specifications, and the even-numbered equations include year fixed effects. Results remain essentially the same.

6 Specification and falsification tests

Using guidance from Lee and Lemieux (2010) and Card et al. (2009), I ran several tests to check the robustness of the results. Because results were robust only for the second kink, I restrict my report on the results of the tests for this case.

6.1 Polynomial/placebo test

As described in Lee and Lemieux (2010), I ran a test for the correct polynomial form as follows: I added sets of bin dummies to the regressions (a set of bins $100 wide were chosen for each bandwidth). If a joint test of significance on the bin dummies rejects the null that the dummies are jointly 0, higher-order polynomial terms are added and the test is run again until a model can no longer reject the null. For the analysis at the second kink and for women with one child, no polynomial orders were rejected. In contrast, for women with more than one child, the second and third orders in the $1000 bandwidth did reject the null (in each case, at a p value of 0.04). In the $2000 bandwidth, no orders were rejected. From the results of the test, the third order result in the $2000 bandwidth is slightly preferred.

This test can also give insight into whether there are other discontinuities besides the cutoff in the regression function, since the test measures whether the coefficients on the bin dummies are the same (in other words, there is no discontinuity in the regression line at bin edges). To further check that the change in slope in hours occurs uniquely at the kink, I created placebo cutoffs at $10 increments over each bandwidth and checked that no abrupt changes in slope occur at these cutoffs. Some change in slope may occur by random chance, but I considered the test a failure if more than 5 percent of the placebo coefficients were significant at the same level as the estimate at the true cutoff.

The test passed for each of the specifications that were significant for the second kink, except for the first bandwidth and third polynomial for women with more than one child (12%). Percents of significant coefficients ranged from 0.5% for women with one child at the $3000 bandwidth and linear specification and 5% for women with more than one child at the first bandwidth and second polynomial.

6.2 Ineligibles

A second test posits that a population similar to the one being considered, single mothers, should not experience a change in behavior at the kink point when they in fact are not eligible for a benefit. Using single women without children, I reran the analysis for the $1000 and $2000 bandwidth choice, using the second kink (in other words, I artificially gave this group of ineligible women the same "treatment" as women with children). The results are reported in Table 5. In all cases, coefficients are not statistically different from zero.

6.3 Heaping

Another concern regards the assignment variable, since attributes of workers who round earnings may influence the dependent variable, leading to biased estimates (Barreca et al., 2010). Using linked CPS/IRS data improves issues of both rounding and systematic over- or underestimation of earning for 75% of the sample, but as seen in the histograms of earnings, heaping is still a problem. To check for bias, I created a dummy variable equal to 1 for those observations that are heaped (a count more than 20) and interacted this dummy with the slope terms. Results are reported in Table 6. While the estimates of β_1 for women with more than one child are roughly the same, results for those with one child are more precisely estimated and slightly larger (about 0.05 rather than 0.04). The linear specification in the 2000 bandwidth is also now statistically different from 0, and roughly the same size as the results in the larger bandwidth and linear specification.

6.4 Seemingly unrelated regressions

Next, I checked more formally that no covariates display a difference in behavior at the kink point in the assignment variable. Having looked at the graphs, it is clear that some tax variables do experience a change at or near the kink point for women with one child.

To formally test the available covariates, I performed a seemingly unrelated regression analysis as recommended by Lee and Lemieux (2010) for each specification shown in table 4 and using the same covariates. Reported in 7 are the coefficients for each of the tax and transfer variables. The model also included all of the demographic characteristics used in the covariate model. For women with more than one child and for each bandwidth choice and polynomial order that yielded statistically significant results, an F test failed to reject the null hypothesis that all coefficients were jointly equal to zero in the seemingly unrelated regressions. For women with one child, the first polynomial order and largest bandwidth specification yielded a strong result for the Child Tax Credit, which kicks in very close to the second kink in the EITC. The seemingly unrelated regression model for this specification rejected the null at $p < 0.000$.

These results are consistent with the graphical representation, and provide some evidence that it would be impossible to distinguish a response to EITC policy for this group that is separate from a response to other tax policies.

7 Conclusion

The analysis presented here examined the intensive-margin labor supply response of single mothers to the EITC using a regression kink design. For women with more than one child, the preferred specification indicated that women just beyond the kink in the EITC benefit function where the benefit begins to decrease responded by reducing hours of work by approximately 0.5 of an hour per year. This estimate withstood several robustness checks, although other polynomial specifications did not. No effect that withstood robustness checks was found for women with only one child, and no effect was found for either group at the kink in the benefit function where earners enter the plateau.

More than one argument could be made to explain these results. In regards to entering the plateau region, arguments that have been made in the past may hold true here: such low earners may have no say in the number of hours they work, but must rely on labor-market norms and expectations. Another argument may be that there is simply no income effect: Workers at this low a level of earnings may wish for more hours of work regardless of receiving the maximum benefit if they perceive the benefit as a reward for work and not as an hourly wage subsidy.

At the second kink, working mothers face a steep marginal tax. Earners in the phaseout region lose 21.06 cents for every extra dollar they earn if they have two or more children, and 15.98 cents if they have one. Combined with payroll tax and federal and state income tax, phaseout-region taxpayers can face a marginal tax that exceeds 50% of their income (Liebman, 1998). It is not surprising, then, that any hours effect would be discernible here. Why women with two children appear to respond when women with one child do not might be explained by other tax and transfer policies that combine to confound the effect for the latter group.

However, there is always the possibility that these two groups value "leisure" differently. For single mothers, "leisure" is most likely to have the meaning "work at home": housework, childcare, and so forth. The trade-off with hours of work involves time foregone raising children and the cost of childcare. One would expect this trade-off to become more expensive, psychologically and monetarily, with each additional child. Perhaps the difference between these groups of women indicates that a substitution effect, albeit measured at a later time than the earnings decision, does exist. If this is the case, the EITC expansion in 2009 that created a more generous schedule for families with three children likely cushioned the trade-off between paid work and work at home. Other changes to the EITC that have been suggested include instituting a less distortionary phase-out schedule (for example, phasing out multiple-children families at the same rate as single-child families) and providing a joint EITC/Child Tax Credit. However, it should be noted that while the reported coefficients are statistically significant, they are economically small. For any change in benefit structure, the cost of the change may outweigh any positive inducement for further hours worked.

This analysis contributes to the literature by providing evidence that some single mothers reduce their hours of work—albeit a very small amount—in response to what they receive in EITC. It also contributes to a train of inquiry into behavioral responses to updated information. The use of administrative records in the form of tax data is a marked improvement over using entirely CPS-reported earnings, although CPS earnings must still be used for non-tax-filers and for years when tax data is not available. The main limitations to the analysis presented here are the extent to which earners are truly able to update their information regarding the EITC, plus certain undesirable features of the data, including uncertainty regarding EITC receipt and the accuracy of reported earnings. However, the results of the study are suggestive of an hours effect for a group whose labor-market attachment is of great interest to policymakers, and further research using a RKD approach on better data may shed even more light on the topic.

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Table 1: Summary statistics

One child	First kink						Second kink					
Bandwidth	$1,000		$2,000		$3,000		$1,000		$2,000		$3,000	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
White	0.74	(0.44)	0.74	(0.44)	0.72	(0.45)	0.71	(0.45)	0.72	(0.45)	0.72	(0.45)
Black	0.20	(0.40)	0.20	(0.40)	0.21	(0.41)	0.22	(0.42)	0.22	(0.42)	0.22	(0.41)
Other	0.06	(0.25)	0.06	(0.24)	0.06	(0.24)	0.06	(0.25)	0.06	(0.23)	0.06	(0.24)
Age	30.30	(8.86)	30.46	(8.94)	30.31	(8.92)	32.45	(8.80)	32.22	(8.74)	32.36	(8.73)
Less than high school	0.18	(0.38)	0.19	(0.40)	0.19	(0.39)	0.16	(0.37)	0.16	(0.37)	0.16	(0.36)
H.S. degree	0.40	(0.49)	0.39	(0.49)	0.40	(0.49)	0.40	(0.49)	0.40	(0.49)	0.41	(0.49)
Some college	0.35	(0.48)	0.35	(0.48)	0.35	(0.48)	0.36	(0.48)	0.37	(0.48)	0.37	(0.48)
College degree	0.06	(0.24)	0.06	(0.23)	0.06	(0.23)	0.06	(0.24)	0.06	(0.24)	0.06	(0.24)
Post college	0.01	(0.08)	0.01	(0.10)	0.01	(0.10)	0.01	(0.11)	0.01	(0.10)	0.01	(0.11)
Age of youngest child	11.00	(10.74)	11.15	(10.98)	11.09	(10.82)	12.36	(11.31)	12.05	(10.99)	12.14	(10.82)
TANF	220.00	(863.60)	199.30	(804.70)	211.70	(965.00)	86.01	(547.50)	86.34	(544.00)	84.81	(556.90)
Food stamps	663.50	(1454.00)	598.40	(1266.00)	575.30	(1216.80)	275.40	(844.70)	276.80	(846.30)	268.10	(843.90)
SSI	68.59	(657.00)	55.26	(604.70)	56.88	(608.10)	63.38	(661.70)	61.81	(640.70)	60.79	(658.30)
State marginal tax	0.18	(2.70)	0.27	(2.63)	0.32	(2.65)	2.46	(3.00)	2.57	(3.13)	2.58	(3.24)
Federal tax burden	21.50	(193.90)	32.83	(628.90)	39.92	(868.50)	192.30	(1119.10)	199.30	(862.60)	295.70	(5239.00)
Child tax credit	9.60	(72.31)	7.90	(68.27)	8.60	(71.43)	87.06	(155.20)	97.39	(170.50)	112.00	(191.60)
Number of obs.	1036		2159		3247		1468		2940		4426	

More than one child	First kink				Second kink			
Bandwidth	$1,000		$2,000		$1,000		$2,000	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
White	0.66	(0.48)	0.67	(0.47)	0.67	(0.47)	0.67	(0.47)
Black	0.29	(0.45)	0.28	(0.45)	0.28	(0.45)	0.28	(0.45)
Other	0.05	(0.22)	0.05	(0.22)	0.06	(0.23)	0.06	(0.24)
Age	33.99	(7.14)	34.09	(7.23)	34.78	(7.09)	34.91	(7.11)
Less than high school	0.25	(0.43)	0.25	(0.44)	0.23	(0.42)	0.23	(0.42)
H.S. degree	0.41	(0.49)	0.41	(0.49)	0.42	(0.49)	0.41	(0.49)
Some college	0.30	(0.46)	0.30	(0.46)	0.30	(0.46)	0.31	(0.46)
College degree	0.04	(0.20)	0.04	(0.19)	0.05	(0.21)	0.04	(0.20)
Post college	0.01	(0.08)	0.01	(0.08)	0.01	(0.09)	0.01	(0.09)
Age of youngest child	11.92	(12.03)	11.65	(11.84)	12.52	(12.38)	12.31	(12.09)
TANF	344.30	(1481.50)	326.90	(1366.80)	188.90	(1057.20)	206.90	(1131.30)
Food stamps	1143.60	(1865.40)	1155.60	(1842.10)	802.20	(1537.50)	811.90	(1547.00)
SSI	124.90	(994.80)	137.80	(1206.70)	127.40	(1068.10)	123.70	(1117.50)
State marginal tax	0.03	(3.14)	0.17	(3.09)	1.78	(2.83)	1.84	(2.97)
Federal tax burden	29.24	(731.00)	25.90	(606.50)	27.95	(195.40)	41.27	(712.00)
Child tax credit	5.59	(79.43)	7.98	(97.88)	19.00	(128.50)	20.85	(140.10)
Number of obs.	1771		3493		2066		4040	

Table 2: Regression kink design estimates of change in hours worked, first kink

Women with one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	3	4	5	6
β_1	−0.059	−0.018	−0.633	−0.662	−0.632	−0.281
	(0.106)	(0.108)	(0.388)	(0.398)	(0.941)	(0.976)
BIC	16064	16044	16062	16041	16058	16036
Obs.	1036					
Bandwidth 2000						
β_1	0.014	0.021	−0.245	−0.264	−0.449	−0.391
	(0.036)	(0.037)	(0.140)	(0.143)	(0.335)	(0.340)
BIC	33619	33602	33614	33597	33614	33596
Obs.	2163					
Bandwidth 3000						
β_1	−0.016	−0.009	0.073	0.058	−0.370*	−0.356*
	(0.019)	(0.020)	(0.074)	(0.074)	(0.176)	(0.177)
BIC	50482	50461	50479	50459	50467	50448
Obs.	3252					
Women with more than one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	1	2	1	2
β_1	−0.019	−0.064	−0.317	−0.163	0.766	0.596
	(0.075)	(0.077)	(0.261)	(0.267)	(0.641)	(0.660)
BIC	27410	27391	27406	27388	27402	27386
Obs.	1780					
Bandwidth 2000			1			
β_1	0.005	−0.002	−0.046	−0.062	−0.167	−0.181
	(0.025)	(0.026)	(0.098)	(0.100)	(0.223)	(0.226)
BIC	53748	53723	53748	53723	53746	53721
Obs.	3505					

Robust standard errors in parentheses. Odd-numbered models are parsimonious, using only the slope terms. Even-numbered models include year fixed effects. Each bandwidth choice expresses distance from the first kink in 2008 dollars. The dependent variable is hours worked per year.

Table 3: Regression kink design estimates of change in hours worked, second kink

Women with one child	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	3	4	5	6
β_1	0.013	−0.018	0.342	0.253	1.037	1.037
	(0.073)	(0.075)	(0.287)	(0.293)	(0.710)	(0.710)
BIC	22288	22271	22285	22269	22283	22283
Obs.	1471					
Bandwidth 2000						
β_1	−0.036	−0.047	0.084	0.110	0.169	0.077
	(0.026)	(0.026)	(0.098)	(0.100)	(0.235)	(0.236)
BIC	44517	44498	44515	44494	44515	44494
Obs.	2946					
Bandwidth 3000						
β_1	−0.033***	−0.040**	−0.015	0.002	0.096	0.063
	(0.014)	(0.014)	(0.053)	(0.054)	(0.128)	(0.129)
BIC	66986	66965	66986	66964	66982	66960
Obs.	4432					
Women with more than one child	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	1	2	1	2
β_1	−0.069	−0.084	−0.521*	−0.464*	−0.876	−1.213*
	(0.059)	(0.060)	(0.214)	(0.232)	(0.536)	(0.546)
BIC	31341	31311	31335	31307	31333	31303
Obs.	2071					
Bandwidth 2000			1			
β_1	−0.019	−0.024	−0.082	−0.038	−0.425*	−0.529**
	(0.021)	(0.021)	(0.080)	(0.081)	(0.191)	(0.195)
BIC	61147	61125	61143	61122	61138	61112
Obs.	4052					

Robust standard errors in parentheses. Odd-numbered models are parsimonious, using only the slope terms. Even-numbered models include year fixed effects. Each bandwidth choice expresses distance from the second kink in 2008 dollars. The dependent variable is hours worked per year.

Table 4: Regression kink design estimates of change in hours worked, second kink, including covariates

Women with one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	3	4	5	6
β_1	0.002	−0.016	0.409	0.325	1.116	1.116
	(0.074)	(0.075)	(0.291)	(0.298)	(0.716)	(0.716)
BIC	22193	22182	22190	22179	22187	22187
Obs.	1468					
Bandwidth 2000						
β_1	−0.034	−0.036	0.118	0.113	0.092	0.054
	(0.025)	(0.026)	(0.097)	(0.099)	(0.235)	(0.236)
BIC	44330	44316	44326	44313	44326	44313
Obs.	2940					
Bandwidth 3000						
β_1	−0.034*	−0.034*	0.004	0.006	0.088	0.085
	(0.014)	(0.014)	(0.053)	(0.054)	(0.128)	(0.129)
BIC	66760	66744	66759	66743	66755	66739
Obs.	4426					
Women with more than one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	1	2	1	2
β_1	−0.072	−0.066	−0.501*	−0.467*	−1.071*	−1.257*
	(0.057)	(0.058)	(0.210)	(0.227)	(0.523)	(0.531)
BIC	31157	31136	31151	31131	31148	31127
Obs.	2066					
Bandwidth 2000			1			
β_1	−0.019	−0.019	−0.054	−0.036	−0.467*	−0.515**
	(0.020)	(0.021)	(0.079)	(0.079)	(0.187)	(0.190)
BIC	60760	60746	60758	60744	60749	60734
Obs.	4040					

Robust standard errors in parentheses. Covariates include race, age, education, age of youngest child, and receipt of TANF, food stamps, Supplemental Security Income, the Child Tax Credit, marginal state income tax, federal income tax burden, and probability of having matched IRS data. Each bandwidth choice expresses distance from the second kink in 2008 dollars. The dependent variable is hours worked per year.

Table 5: Regression kink design estimates of change in hours worked, second kink, using single women with no children

Women with no children						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	1	2	1	2
β_1	0.022	0.000	−0.070	−0.060	−0.161	−0.246
	(0.046)	(0.047)	(0.173)	(0.180)	(0.430)	(0.434)
BIC	68159	68130	68157	68129	68157	68129
Obs.	4456					
Bandwidth 2000			1			
β_1	−0.003	−0.015	−0.058	−0.021	0.137	0.098
	(0.016)	(0.016)	(0.063)	(0.063)	(0.149)	(0.149)
BIC	135649	135603	135644	135600	135642	135599
Obs.	8866					

Robust standard errors in parentheses. Women are defined as having "no children" if no other person is dependent upon them. Odd-numbered models are parsimonious, using only the slope terms. Even-numbered models include year fixed effects. Each bandwidth choice expresses distance from the second kink in 2008 dollars. The dependent variable is hours worked per year.

Table 6: Regression kink design estimates of change in hours worked, controlling for heaping

Women with one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	3	4	5	6
β_1	−0.022	−0.032	0.162	0.176	0.724	0.724
	(0.076)	(0.077)	(0.296)	(0.304)	(0.741)	(0.741)
BIC	22284	22269	22278	22266	22275	22275
Obs.	1471					
Bandwidth 2000						
β_1	−0.057	−0.060	0.056	0.086	0.027	−0.023
	(0.027)	(0.027)	(0.103)	(0.105)	(0.247)	(0.248)
BIC	44524	44508	44518	44503	44517	44501
Obs.	2946					
Bandwidth 3000						
β_1	−0.049	−0.051	−0.037	−0.024	0.036	0.023
	(0.015)	(0.015)	(0.057)	(0.058)	(0.135)	(0.135)
BIC	66971	66954	66967	66951	66964	66948
Obs.	4432					
Women with more than one child						
	Poly Order One		Poly Order Two		Poly Order Three	
Bandwidth 1000	1	2	1	2	1	2
β_1	−0.079	−0.066	−0.576	−0.414	−1.318	−1.489
	(0.064)	(0.064)	(0.229)	(0.242)	(0.571)	(0.579)
BIC	31340	31310	31335	31305	31325	31297
Obs.	2071					
Bandwidth 2000			1			
β_1	−0.027	−0.025	−0.103	−0.043	−0.453	−0.507
	(0.022)	(0.022)	(0.086)	(0.087)	(0.204)	(0.206)
BIC	61145	61124	61139	61118	61134	61109
Obs.	4052					

Robust standard errors in parentheses. A binary variable equal to 1 if an observation is "heaped" (see text) is interacted with the slope terms. Even-numbered models include year fixed effects. Each bandwidth choice expresses distance from the second kink in 2008 dollars. The dependent variable is hours worked per year.

Table 7: Seemingly unrelated regression estimates

	Women with one child	Women with more than one child		
Bandwidth	3000	1000		2000
Polynomial	1	2	3	3
TANF	−0.013	−0.345	−0.484	0.671
	(0.016)	(0.538)	(1.272)	(0.480)
Food stamps	−0.020	−0.514	0.0609	0.154
	(0.025)	(0.781)	(1.870)	(0.653)
SSI	0.001	−0.060	−0.641	−0.082
	(0.020)	(0.546)	(1.308)	(0.475)
CTC	0.044***	0.079	0.049	0.096
	(0.005)	(0.065)	(0.157)	(0.059)
State income tax rate	0.000	−0.001	−0.004	−0.002*
	(0.000)	(0.001)	(0.003)	(0.001)
Federal income tax	0.197	0.101	0.140	0.130
	(0.157)	(0.100)	(0.239)	(0.302)
In IRS data (x100)	0.001	−0.013	−0.030	−0.040*
	(0.001)	(0.019)	(0.046)	(0.016)
Chi2 test	96.31	12.75	7.79	20.51
P > chi2	(0.000)	(0.622)	(0.932)	(0.153)

Robust standard errors in parentheses. Models reported are those with statistically significant estimates for β_1 in the main results. Models include race, age, education, age of youngest child, number of dependents, and year fixed effects.

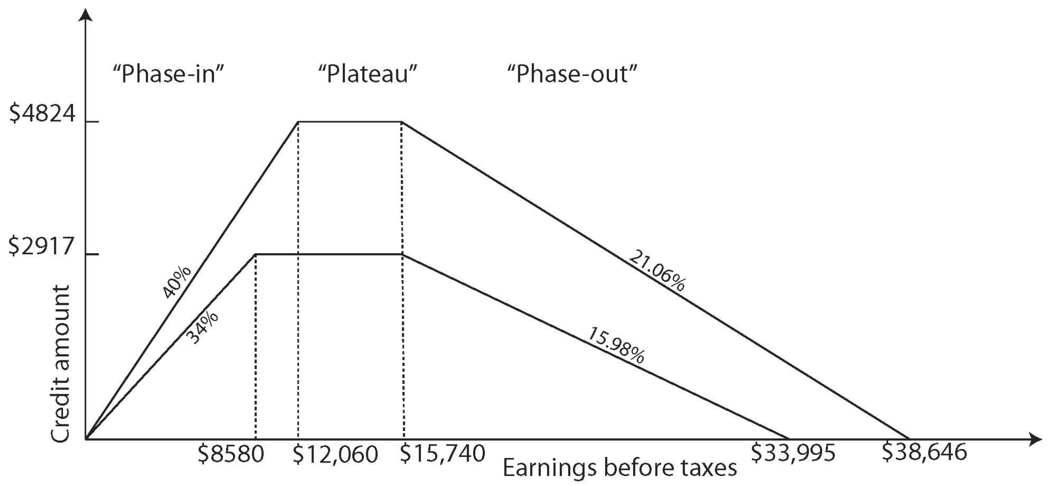

Figure 1: EITC parameters, 2008

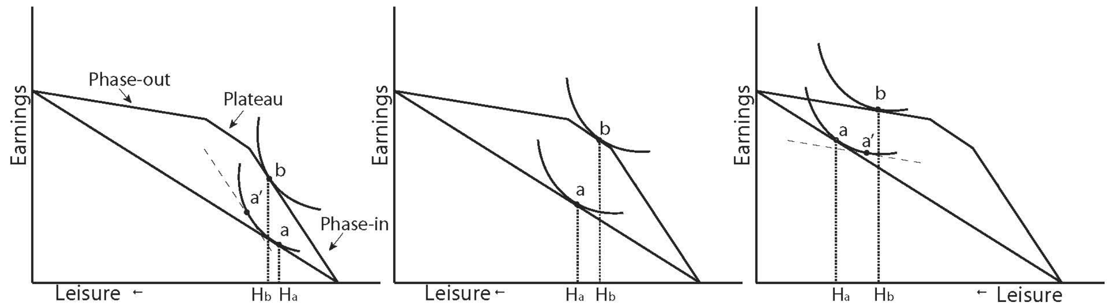

Figure 2: EITC substitution and income effects (see text for description)

Earnings range		Dependents 0	1	2 or more
15,250	**15,300**	0	2,917	4,824
15,300	**15,350**	0	2,917	4,824
15,350	**15,400**	0	2,917	4,824
15,400	**15,450**	0	2,917	4,824
15,450	**15,500**	0	2,917	4,824
15,500	**15,550**	0	2,917	4,824
15,550	**15,600**	0	2,917	4,824
15,600	**15,650**	0	2,917	4,824
15,650	**15,700**	0	2,917	4,824
15,700	**15,750**	0	2,917	4,824
15,750	**15,800**	0	2,912	4,817
15,800	**15,850**	0	2,904	4,806
15,850	**15,900**	0	2,896	4,796
15,900	**15,950**	0	2,888	4,785
15,950	**16,000**	0	2,880	4,775

Figure 3: Schedule of EITC used by taxpayers

Note: For 4 to 17, the left-hand graph shows the result for those with earnings around the first kink, and the right-hand graph shows results for those around the second kink. In each case the bandwidth is $2000 and the bin number is 40.

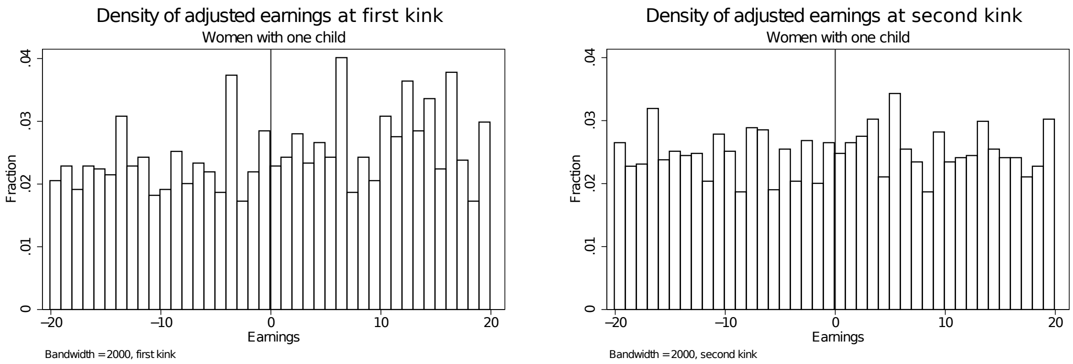

Figure 4: Histogram of earnings, women with one child.

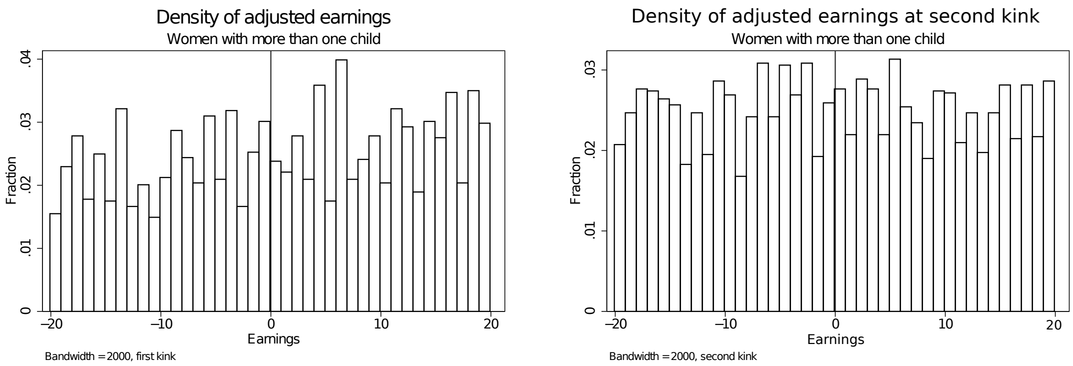

Figure 5: Histogram of earnings, women with more than one child.

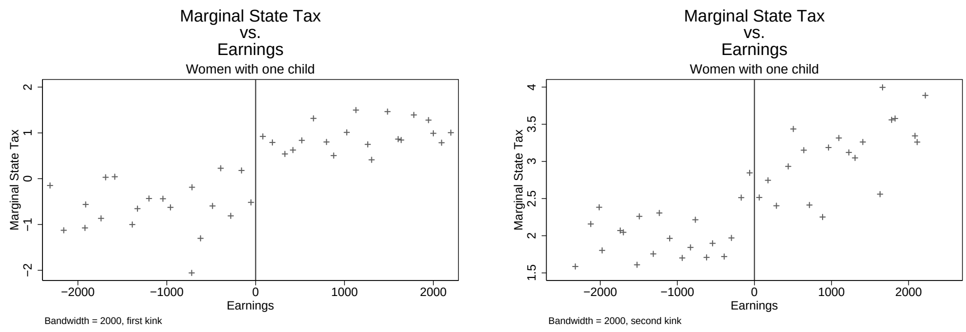

Figure 6: State marginal tax rate, women with one child.

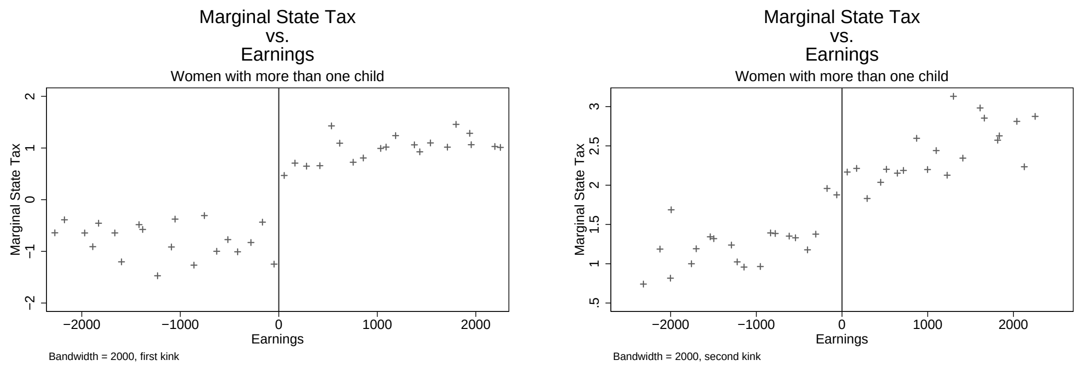

Figure 7: State marginal tax rate, women with more than one child.

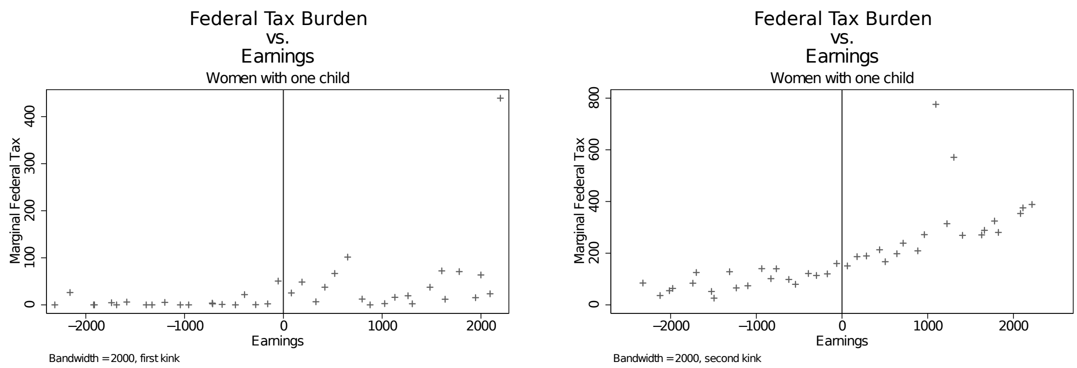

Figure 8: Federal tax burden before credits, women with one child.

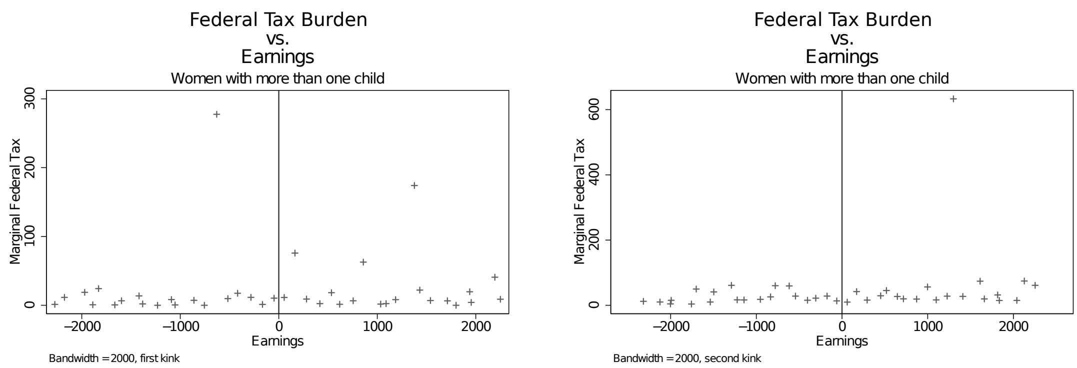

Figure 9: Federal tax burden before credits, women with more than one child.

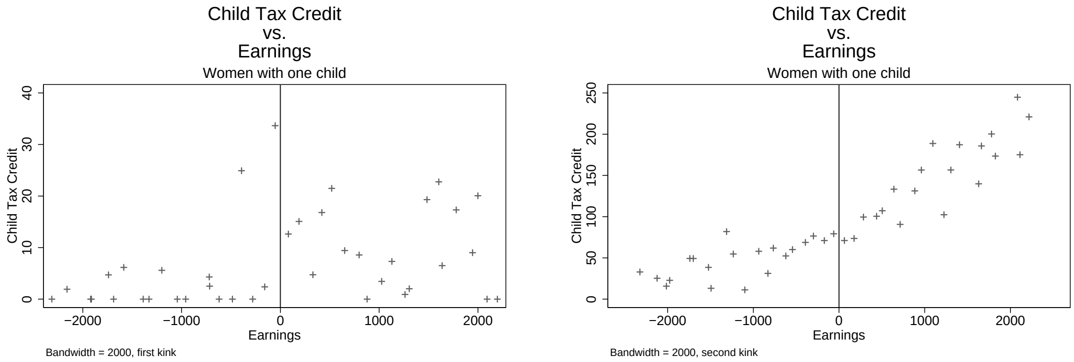

Figure 10: Child tax credit, women with one child.

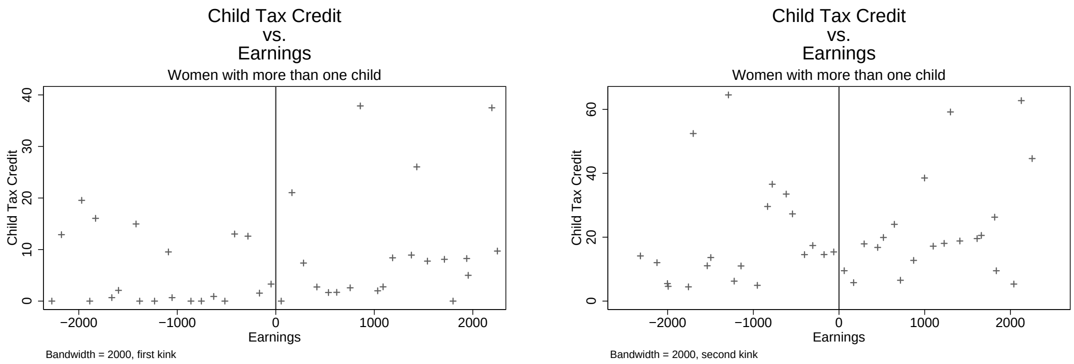

Figure 11: Child tax credit, women with more than one child.

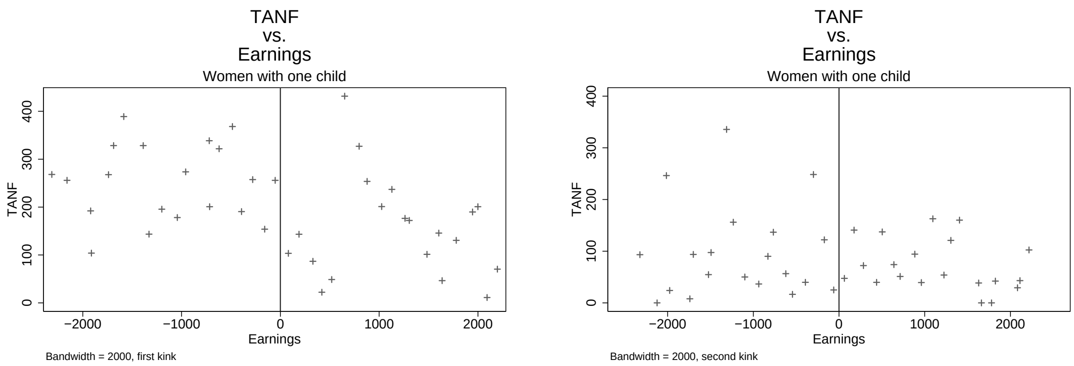

Figure 12: TANF receipt, women with one child.

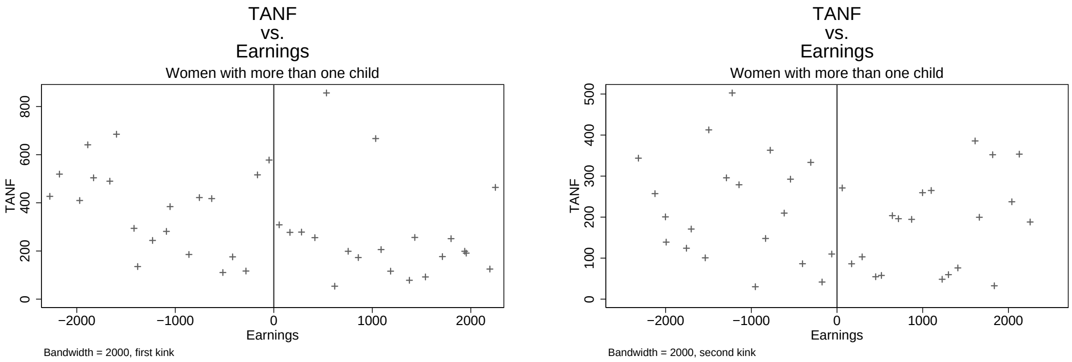

Figure 13: TANF receipt, women with more than one child.

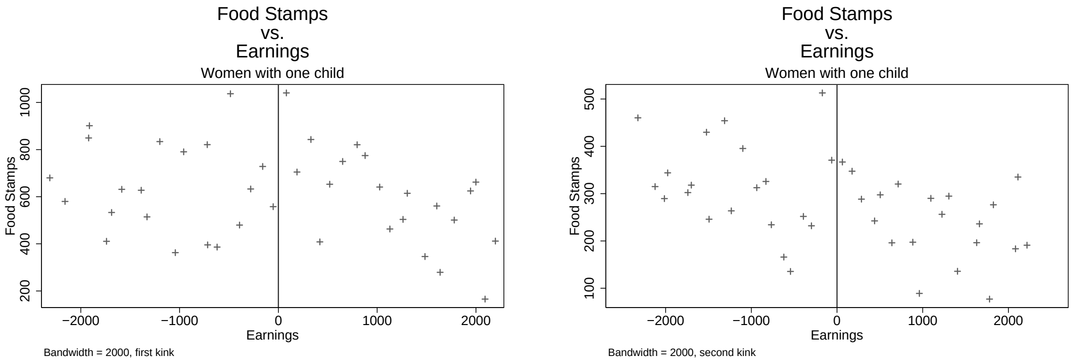

Figure 14: Food stamp receipt, women with one child.

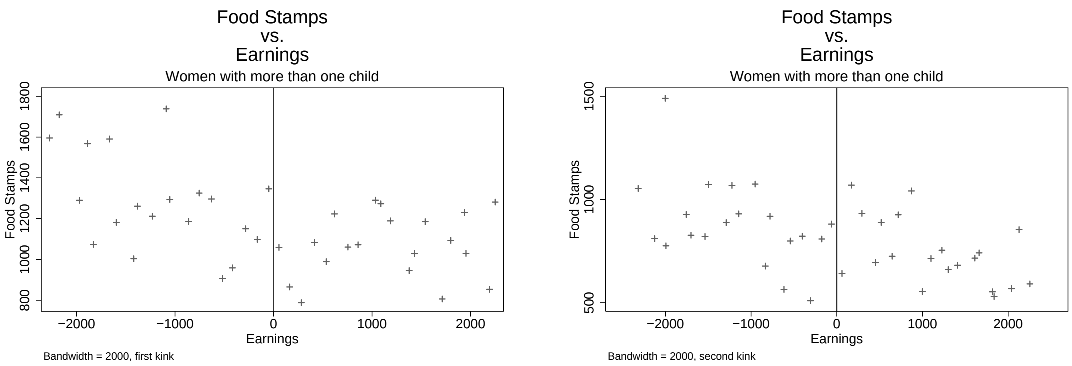

Figure 15: Food stamp receipt, women with more than one child.

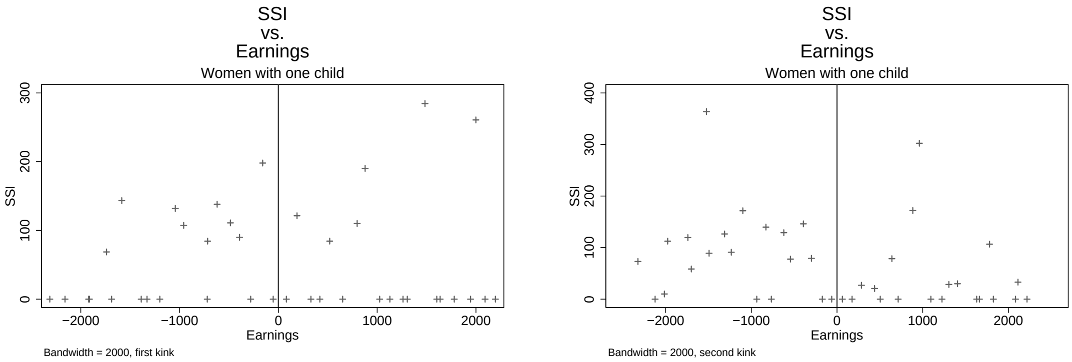

Figure 16: Supplemental Security Income receipt, women with one child.

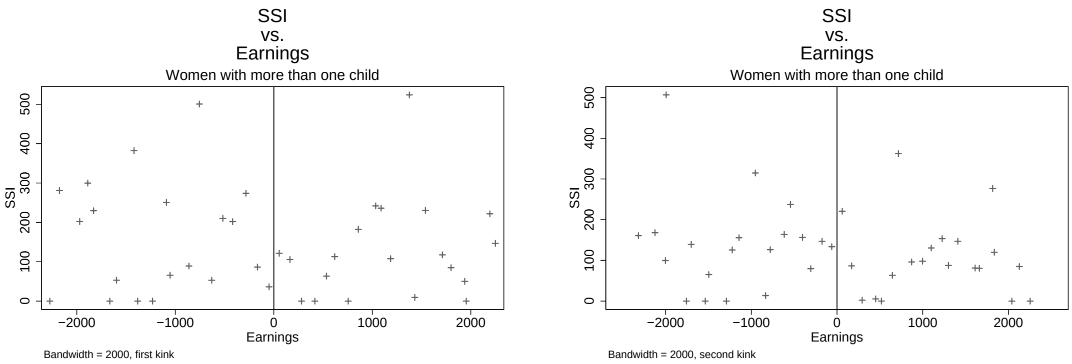

Figure 17: Supplemental Security Income receipt, women with more than one child.

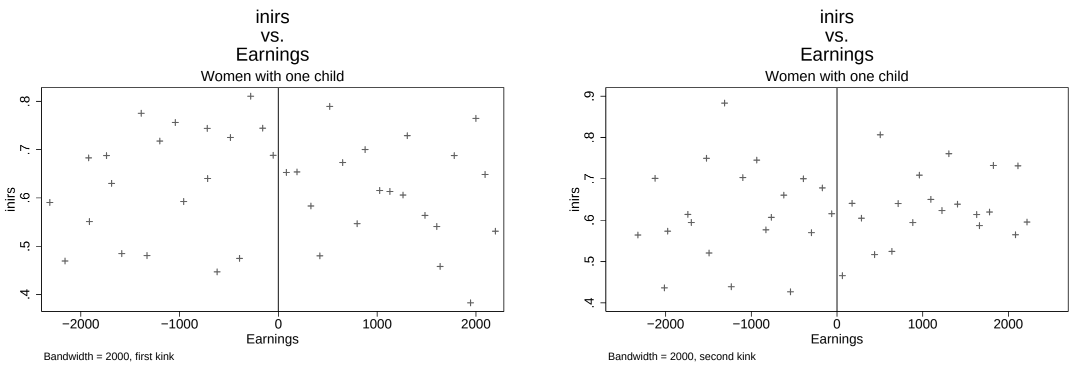

Figure 18: Probability of IRS match, women with one child.

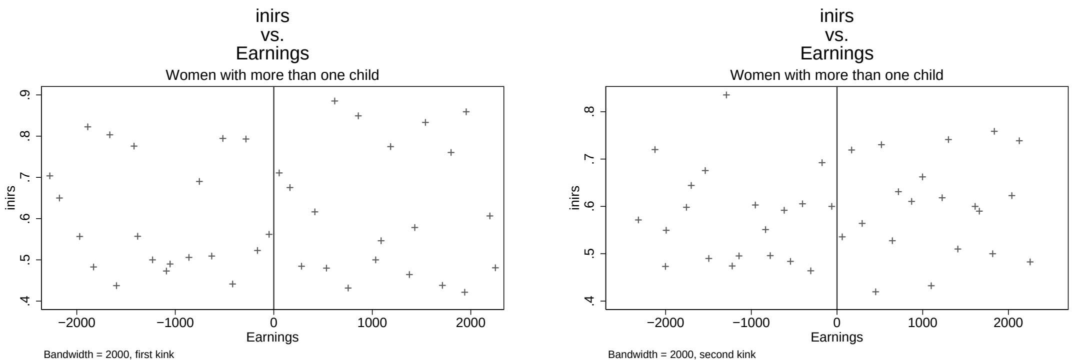

Figure 19: Probability of IRS match, women with more than one child.

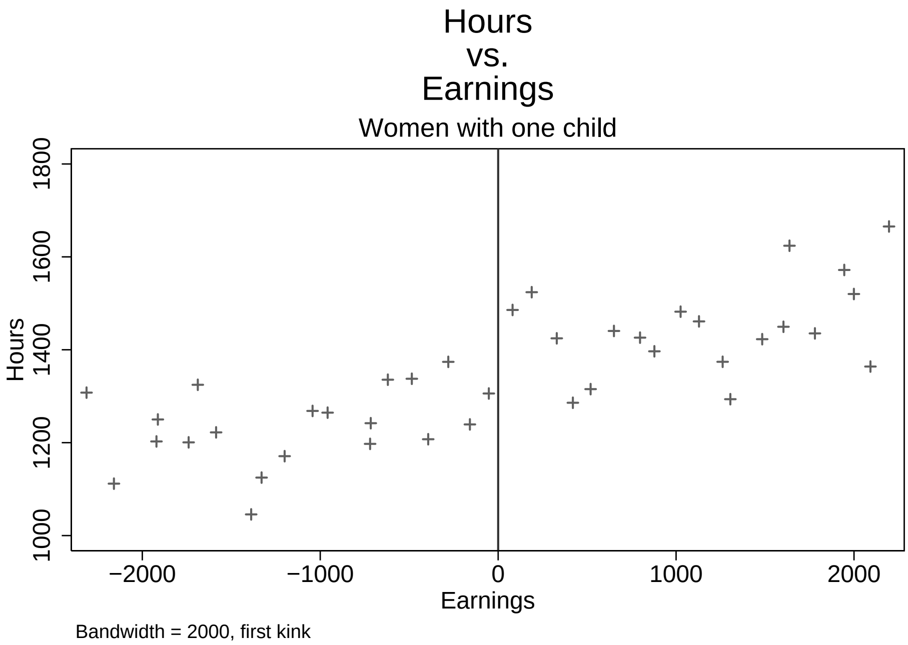

Figure 20: Hours worked vs. earnings, women with one child, first kink

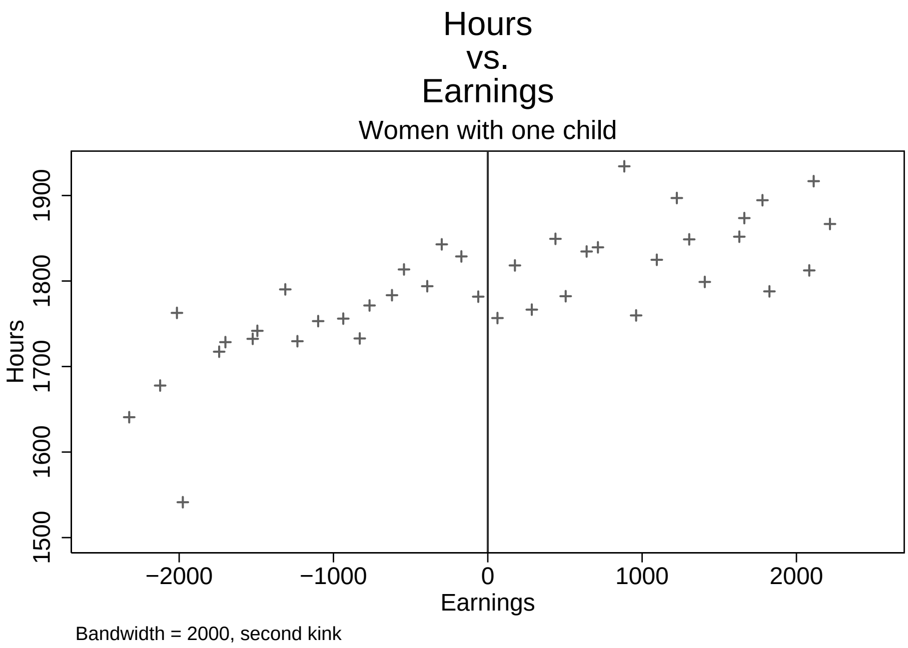

Figure 21: Hours worked vs. earnings, women with one child, second kink

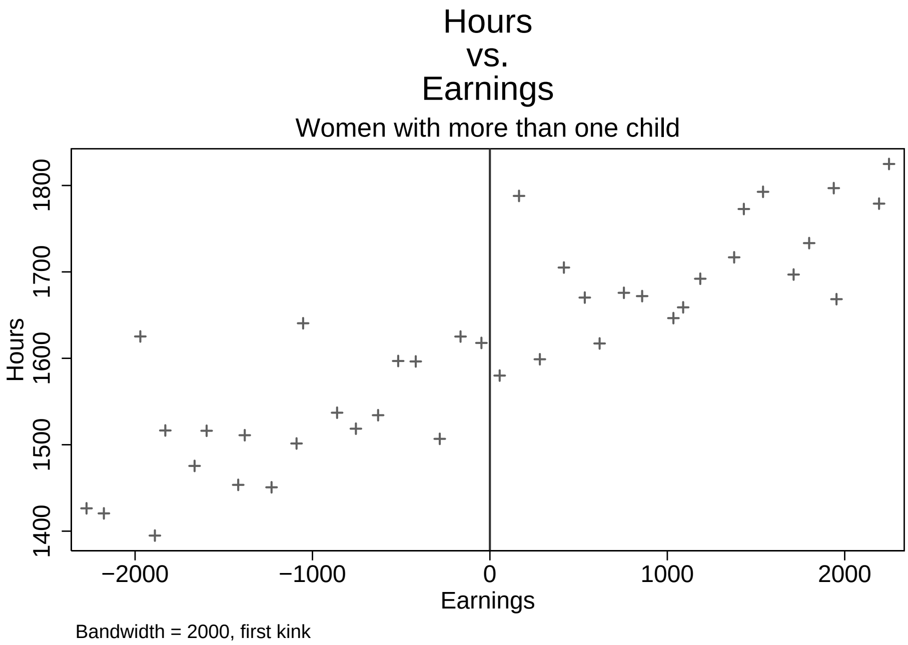

Figure 22: Hours worked vs. earnings, women with more than one child, first kink

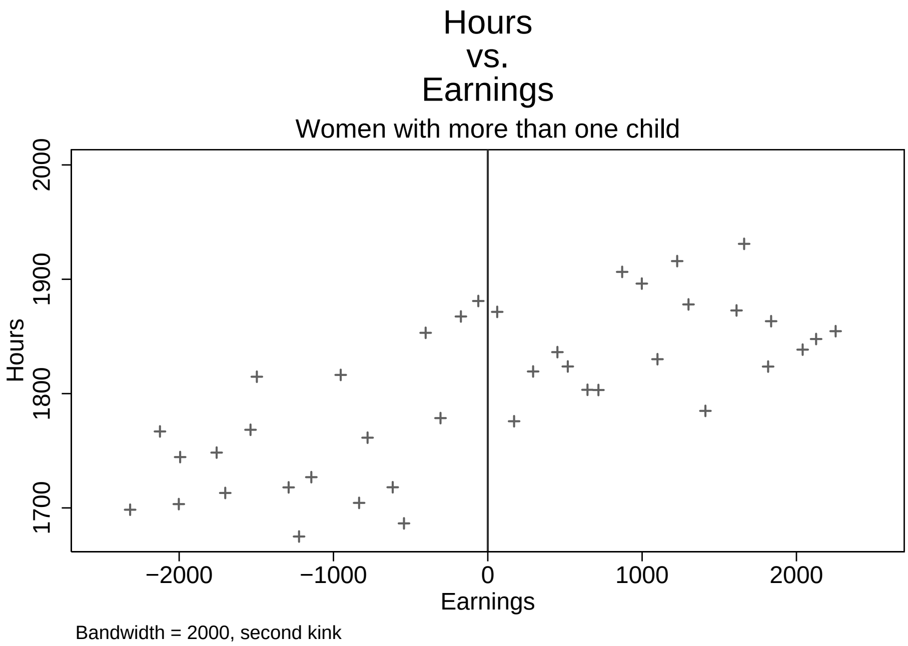

Figure 23: Hours worked vs. earnings, women with more than one child, second kink