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Income and Child Maltreatment in Unmarried Families: Evidence from the Earned Income Tax Credit

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Abstract

This study estimates the associations of income with both (self-reported) child protective services (CPS) involvement and parenting behaviors that proxy for child abuse and neglect risk among unmarried families. Our primary strategy follows the instrumental variables (IV) approach employed by Dahl and Lochner (2012), which leverages variation between states and over time in the generosity of the total state and federal Earned Income Tax Credit for which a family is eligible to identify exogenous variation in family income. As a robustness check, we also estimate standard OLS regressions (linear probability models), reduced form OLS regressions, and OLS regressions with the inclusion of a control function (each with and without family-specific fixed effects). Our micro-level data are drawn from the Fragile Families and Child Wellbeing Study, a longitudinal birth-cohort of relatively disadvantaged urban children who have been followed from birth to age nine. Results suggest that an exogenous increase in income is associated with reductions in behaviorally-approximated child neglect and CPS involvement, particularly among low-income single-mother families.

I. Introduction

A large and longstanding literature documents that low-income, poverty, and other markers of socioeconomic disadvantage are associated with increased risk of child abuse and neglect (Berger & Waldfogel, 2011; Paxson & Waldfogel, 2002; Slack et al., 2003). Yet, despite this

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body of work and the considerable public and private costs of child maltreatment (Fang et al., 2012), there is a striking dearth of evidence on whether this relation is causal. Randomized trials of income-reducing or enhancing interventions have rarely involved maltreatment-related outcomes (for exceptions, see Cancian et al., 2013; Fein & Lee, 2003), and few studies have applied rigorous techniques for isolating the exogenous impact of income on child maltreatment.

We use an instrumental variables (IV) strategy to estimate the effect of income on child maltreatment. Our approach, which closely follows that of Dahl and Lochner (2012), leverages differences between states and over time in the generosity of the Earned Income Tax Credit (EITC) for which a family is eligible to identify exogenous variation in income and subsequently estimate the unbiased local average treatment effect of income on maltreatment. We also employ standard OLS regressions (linear probability models), OLS regressions with the inclusion of a control function, and reduced form OLS regressions (each of which is estimated with and without the inclusion of family-specific fixed effects) to test the robustness of our findings.

Our data are drawn from the Fragile Families and Child Wellbeing Study (FFCW), an urban, population-based birth cohort that has been followed from a focal child's birth through age nine. We limit our analysis sample to families for whom the EITC is relevant: unmarried families with gross incomes below $45,000. Our child maltreatment measures consist of both (self-reported) child protective services (CPS) involvement and behaviorally approximated measures of child abuse and child neglect. We find that an exogenous increase in income is associated with a modest reduction in behaviorally-approximated child neglect and relatively large reduction in CPS involvement, particularly among low-income single-mother families.

II. Background

The EITC is a refundable federal tax credit that supplements the earnings of low-wage workers. The credit amount varies by earnings, marital status, and number of children, ranging in 2012 from a maximum of almost $500 for a single adult to a nearly $6,000 for a family with three or more children (Center on Budget and Policy Priorities, 2013). These amounts are supplemented in 24 states with state EITCs that vary as a proportion of the federal credit. Together, the federal and state EITCs comprise a highly successful component of the contemporary U.S. social welfare safety net that incentivizes work, given a gradual phase-in/phase-out structure, and lifts significant numbers of families out of poverty (Bitler et al., 2013; Meyer, 2010; Short, 2012). These factors suggest that EITC participation may positively influence child and family wellbeing, a hypothesis that is supported by recent empirical research (Baker, 2008; Baughman & Dickert-Conlin, 2009; Boyd-Swan et al., 2013; Dahl & Lochner, 2012; Evans & Garthwaite, 2011; Herbst, 2011; Hoynes et al., 2012; Strully et al., 2013). Furthermore, despite that the EITC is generally received once a year as a lump-sum tax credit or refund, research indicates that families anticipate the benefit and that it acts as forced savings. Families are thereby able to plan for its use, smooth consumption accordingly, and tap it for large expenses such as security deposits, rent or

utility arrears, appliance or automobile purchase or repair, and investments in goods and services for children (Halpern-Meekin et al., 2015).

To date, there have been no micro-level studies of links between the EITC and child maltreatment. More generally, there have been no rigorous studies of the causal role of income on child maltreatment, with two potential exceptions. Fein and Lee (2003), using data from Delaware's randomized welfare reform experiment, found that random assignment to a less generous, Temporary Assistance for Needy Families (TANF)-like welfare program (which included work requirements, sanctions, time limits, and family caps, in addition to a smaller cash benefit) was associated with increased CPS involvement, particularly for child neglect, relative to assignment to the more generous Aid to Families with Dependent Children (AFDC) program. Because treatment group families were substantially more likely to receive sanctions (benefit cuts) and to have their case closed, these results suggest that decreased access to economic resources may lead to increased child maltreatment. Yet, it cannot be assumed that this reflects a causal impact of income; other aspects of the program such as work requirements, time limits, and family caps may be reflected in, or even drive, the estimates. More recently, Cancian, Yang, and Slack (2013), using data from a randomized control trial, found that an exogenous increase in the amount of child support received by welfare recipients (achieved by random assignment) led to reduced CPS involvement. One concern as to whether their estimates reflect a true causal effect of income, however, is that increased child support receipt, even if exogenously induced, may positively influence parental relationships or noncustodial parent involvement, each of which may be associated with a decreased likelihood of maltreatment, independent of the increase in income. Building on these studies, we aim to estimate the causal influence of income on child maltreatment. We hypothesize that an exogenous increase in income, induced by state EITC expansions, will be associated with reduced child abuse, child neglect, and CPS involvement, and that this relation will be particularly salient with respect to child neglect, which has been especially closely linked to economic resources (Fein & Lee, 2003; Sedlak et al., 2010).

III. Data and Measures

Data

Our data are drawn from FFCW, a longitudinal cohort study of 4,898 children born between 1998 and 2000, in 20 U.S. cities with populations greater than 200,000. FFCW sampled nonmarital births with a 3:1 ratio to marital births. As such, FFCW parents are disproportionately likely to be low-income, have limited educational attainment, be of minority race/ethnicity, be unmarried, and become involved with CPS, relative to the U.S. population. Families were interviewed at the birth of the focal child and when the child was age 1, 3, 5 and 9.

We use observations from the age 3, 5, and 9 interviews, which results in a possible sample of 14,694 family-wave observations of 4,898 families. We first excluded 6,154 observations due to missing data.[1] We then excluded families in which the mother was married at the age-3 interview (2,741 family-wave observations) and families with an adjusted gross income (AGI) of more than $45,000 (in nominal dollars) in any year of observation (1,759

observations), because such families would be well beyond the eligibility cutoff for the EITC. This resulted in a sample of 4,040 family-wave observations of 1,600 families.

The documented benefits of the EITC are most prominent for single-mother families and for families with two or more children (Adireksombat, 2010; Dahl & Lochner, 2012; Dickert-Conlin & Houser, 2002; Hotz et al., 2006; Grogger, 2003; Strully et al., 2013). We therefore limi our analyses to unmarried families. Following Kenkel and colleagues (2014) and Schmeiser (2009), we also limit the sample to families that are potentially eligible for the EITC (those with AGIs of no more than $45,000 per year) because state EITC generosity is only a useful instrument for such families. That is, this restriction strengthens the relation of the instrument to family income (Schmeiser, 2009) and reduces potential bias from the inclusion of non-eligible families in the sample (Schmeiser, 2012).[2] Notably, the types of families that are most likely to be eligible for and who benefit most from the EITC—low-income, single-mother, and larger families—are also at greatest risk for child maltreatment (Berger & Waldfogel, 2011).

Measures

Child maltreatment—We operationalize child maltreatment both via behaviorally-approximated measures of child abuse and neglect, and with mothers' self-reports that they had been investigated by CPS. The behaviorally-approximated measures included subsets of the Parent-Child Conflict Tactic Scales (Straus et al, 1998). Such measures are increasingly used to proxy for child maltreatment using population based data (Berger 2004, 2007; Berger et al., 2005; Font & Berger, 2015; Slack et al., 2011). Our measure of abuse includes 5 indicators of physical violence and emotional aggression, representing the number of times in the past 12 months that the mother: (1) shook the focal child; (2) hit the child with an object; (3) called the child stupid, dumb, or other names; (4) threatened to kick the child out of the home; and (5) swore at the child. In our primary specification, the child abuse indicator is equal to one if the sum of these items falls in the top quartile of values for the FFCW sample; zero otherwise.

Child neglect consists of parental actions or inactions that place a child in situations or environments in which there is a foreseeable risk of harm as a result of inadequate

[1]Specifically, 46% of excluded family-wave observations resulted from a family not being interviewed at a given wave and 42% from missing data on the CPS or behaviorally-approximated maltreatment measures; the remaining exclusions were due to missing income data. Appendix 1 presents a comparison of descriptive statistics from the FFCW sample with fully imputed data and the subsample that we excluded from our analysis due missing data (prior to implementing our sample exclusion criteria). We find few substantive differences in the characteristics of the two samples, although self-reported CPS involvement is lower in the imputed than non-imputed sample (4.1% vs. 5.7%) and there are slightly more single-mother families in the imputed data (47.1% vs. 41.2%). Of course, our analysis sample is more disadvantaged than either of the other samples given that it is limited to families that were unmarried at the age-3 interview and had AGI below $45,000.

[2]We also tested two additional sample selection criteria: (1) including limiting the sample to families with AGI below 130% of poverty (Hardy et al., 2015), and (2) limiting the sample to families in which the mother has a high school education or less, a non-income-related marker of disadvantage (Evans & Garthwaite, 2014). We present results when these samples are used in Appendices 2 and 3. In both cases, the general pattern of results is consistent with that in our primary models, though the second stage IV results are less often statistically significant in the alternative specifications, as would be expected given that they less accurately include families that are eligible for the EITC. Furthermore, the low education sample is larger than that of our primary specification and there is considerably greater variation in income as well as a more skewed income distribution, necessitating that we log the income measures and limiting our confidence in the estimates. Notably, Evans and Garthwaite (2014) use the low education sample selection criteria with a difference-in-difference specification. We are aware of no existing study that uses this sample selection criteria with IV analyses.

supervision, food, shelter, medical care, emotional support, or other material or psychological necessities. We assess neglect via 11 indicators: (1) the child witnessed domestic violence; (2) the mother reported being too drunk or high to care for the child; (3) the mother reported using hard drugs; (4) the mother reported currently using non-prescribed drugs several days per week or more; (5) the mother reported earning income from illegal activities such as drug sales or prostitution; (6) the mother reported leaving the child unsupervised (alone) when she should not have; (7) the mother was unable to ensure that the child received the food he or she needed; (8) the mother was unable to get the child to the doctor or hospital when needed; (9) the family's electricity or heat was shut off for non-payment; (10) the family experienced homelessness; and (11) the family experienced housing-related doubling up for financial reasons. We code child neglect equal to one if the sum of the 11 items falls in the top quartile of FFCW sample values, and zero otherwise. For both abuse and neglect, we estimated supplemental analyses using greater than one-half of a standard deviation (SD) above the sample mean as a maltreatment threshold, as well as a z-scored transformation of the continuous measures.

Note that none of our behaviorally-approximated measures necessarily meet statutory definitions of maltreatment. However, they reflect conditions that commonly bring families to the attention of CPS. For example, exposure to domestic violence and parental drug abuse are cited in 29% and 20% of CPS cases (US Department of Health and Human Services, 2013). Moreover, Slack and colleagues (2011), using data from three population-based studies document that the same types of economic and psychosocial factors similarly predict behaviorally-approximated maltreatment and CPS involvement. Furthermore, Font and Berger (2015) find consistency in estimates of associations of behaviorally-approximated maltreatment measures and self-reported CPS-involvement with subsequent indicators of child development, such that these measures are associated with child development in similar ways as CPS involvement, and are thus thought to tap similar underlying constructs.

We also mothers reports that their family was investigated by CPS. At ages 5 and 9, the focal child's primary caregiver (generally mother) was asked whether the family had been contacted by CPS since the focal child's birth (in the age 5 interview) or since the prior interview (in the age 9 interview). Mothers who answered in the affirmative were asked to provide the date of their most recent CPS contact. We attributed CPS involvement to the interview wave that immediately succeeded the CPS contact date. Consequently, we are likely underestimating CPS involvement at wave 3, given we only know the date of most recent contact at waves 4 and 5.

Relying on self-reported CPS involvement is cause for concern given that there may be systematic bias in reporting. Unfortunately, because no existing national, longitudinal survey includes both income data and administrative data on CPS involvement, self-reports are commonly used in population-based studies (Berger et al., 2009; Lee et al., 2014; Nam et al., 2006; Slack et al., 2011). Prior research documents consistency in the predictors of both self-reported and administratively documented CPS involvement, as well as in the magnitudes of association between these predictors and each measure (Slack et al., 2011). It is also important to recognize that CPS involvement is not necessarily a measure of actual child maltreatment and that a change in income could change a family's likelihood of

coming into contact with CPS without changing its underlying probability of engaging in abuse or neglect.[3]

A final concern is that CPS investigations are likely to underestimate maltreatment, given that a substantial portion of maltreatment is never reported (Sedlak et al., 2010). Conversely, our behaviorally approximated measures may overestimate maltreatment given that they that do not meet legal thresholds for maltreatment. At the same time, however, parents may also underreport poor parenting behaviors, leading to underestimation on these measures. To the extent there is such systematic reporting bias, our results should be biased toward zero. Moreover because CPS involvement may reflect different factors than actual behaviors that place children at risk of maltreatment, the use of behaviorally-approximated maltreatment measures can provide evidence about the mechanisms through which income might affect CPS involvement.

Income and potential EITC benefit—Our primary predictor is post-tax and transfer family income. We began with the FFCW constructed measure of total household income reported by the mother.[4] We then subtracted unearned income (e.g., government benefits, child support) to create a measure of household earnings.[5] Finally, we used our derived earnings data and other income sources and amounts to calculate tax liabilities and credits using TAXSIM version 9.3 (National Bureau of Economic Research, 2015). TAXSIM generates estimates of state and federal tax liabilities or refunds due. The total (state and federal) tax liability (or refund) is then deducted from (added to) total household income to calculate post-tax and transfer (net) income.

TAXSIM also produces the combined state and federal EITC amount for which a family is eligible, given the tax year, their income, filing status (married or unmarried), number of dependents, and state of residence. This amount, which serves as the exogenous source of variation in family income (instrument) in our IV models, assumes full take-up of the EITC, though prior estimates suggest that the take-up rate for the EITC among eligible families is about 80 to 87% (IRS, 2002; Scholz, 1994). All income and EITC amounts are in 2009 dollars.

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[3]Notably, the majority of CPS investigations include allegations that are not able to be substantiated by a preponderance of the evidence. As such, investigations, rather than substantiated cases of maltreatment are widely used in child maltreatment studies because the decision to substantiate often reflects factors unrelated to the actual maltreatment allegations (Font & Maguire-Jack, 2015); furthermore, associations of investigated (but not substantiated) and substantiated maltreatment with child well-being do no differ (Hussey et al., 2005).

[4]In the FFCW age-3 through age-9 interviews, respondents were asked to provide an exact dollar amount of household income. Those that were unable or unwilling were asked to provide a range. Approximately 90% of respondents provided household income data in one of these two forms. The FFCW study team then imputed household income dollar amounts for respondents who reported income in range format based on other respondents who provided income in the same range but via detailed income amount. They then imputed dollar amounts for those with who did not report income in either format. Both imputations included the following covariates: relationship status, age, race/ethnicity, immigrant, employed last year, earnings, total adults in the household, and received welfare in the last year. For a detailed description of the FFCW constructed income variables, see http://www.fragilefamilies.princeton.edu/documentation/core/4waves_ff_public.pdf and http://lotka.princeton.edu/archive/ff/datausers/year9/October_2011updateddocs/year9wave_ff_public.pdf. The income measures used in our primary analyses are based on the FFCW constructed income variables. We also conducted supplemental analyses using only observations with non-imputed income and found no substantive differences in results (see Appendix 5).

[5]Although the FFCW data contain separate measures of earnings, this item is only asked with regard to the respondent. Earnings data for partners are only available if the mother's current partner is the biological father of the focal child; even then, these data are often incomplete. Thus, we determined that subtracting nontaxable income from total income was a superior approach to income based on only those earnings reported.

Although the largest EITC expansions occurred in the 1990s, there is considerable variation across states and over time during our observation period. Table 1 presents federal (in nominal dollars) and state maximum EITC benefits by family size for the states and years included in the study. Of the 15 states in our sample, 9 states had state EITCs during the study period, affecting 60% of sample families (IN, MI, and VA implemented state EITCs during the study period; MA, MD, NJ, and NY expanded their existing EITCs). These changes amounted to meaningful increases in income for eligible families in those states. There were also small increases in the federal EITC. Table 2 illustrates variation in the combined state and federal EITC (in 2009 dollars) for which a single mother with 2 children would be eligible based on earnings of either $15,000 or $30,000 (in 2009 dollars) in years 2001, 2005 and 2009. An EITC-eligible single-parent, two-child family with $15,000 in earnings could receive as much as $3,000 more in states with generous EITCs as compared to those with none.

Covariates—We control for a number of static and time-variant characteristics. Static characteristics include race/ethnicity, maternal education, and number of biological children in the household (at the age-3 interview). Time variant characteristics include family structure (married, cohabiting, single mother), age of the youngest child in the household, the mother's age, whether the mother reported no household income, the average of lagged and current household income, and census tract unemployment and public assistance receipt rates. We use the average of lagged and current household income, rather than simply lagged household income, given the considerable amount of time (2 to 4 years) between FFCW data collection waves.[6] All models also control for wave of observation and either region or state of observation.

IV. Estimation Strategy

We first present results from IV regressions in which the potential EITC benefit available to a family is used to instrument income (our preferred specification). The appropriateness of this approach relies on three assumptions: (1) the available EITC benefit is predictive of variation in net income; (2) the EITC benefit only affects maltreatment through its effect on income; and (3) the EITC benefit is uncorrelated with the error term. The first assumption is easily tested using weak identification tests, which demonstrate the EITC is a strong instrument.[7] The second is justified because the primary purpose of the EITC is to encourage work through wage supplementation and it provides no (direct) non-monetary benefits, thus making it improbable that it would belong in the structural equation. The third assumption is more difficult to substantiate. It is possible that states with more generous EITCs differ from states with smaller or no EITCs on characteristics associated with maltreatment rates. Similarly, changes over time in EITC benefits may co-occur with changes in unobserved local conditions, which may affect the likelihood of maltreatment. We address this potential problem through the inclusion of either region or state dummies, as well as by controlling for the census tract unemployment rate and public assistance receipt rates (we also include wave dummies in all models).

[6]We also conducted our analyses using only lagged income. The results do not change.
[7]For all IV results, we present the Kleibergen-Paap *F*-statistic and the critical values for weak identification (Stock & Yogo, 2005).

Even after accounting for possible confounding effects of time and location, variation in EITC amount is still partly a function of three family characteristics: pretax earnings, marital status, and number of dependents, each of which is likely to be correlated with unobserved family characteristics. To address this, we follow the strategy used by Dahl and Lochner (2012). To begin with, in our calculation of tax liabilities, we hold constant marital status and the number of dependents as equal to the baseline (age 3) value. This removes endogenous changes in family structure and size. Additionally, we include an instrument control function consisting of the average of current and lagged pretax income and its fifth order polynomial, as well as a lagged indicator of zero pretax income. This accounts for the variation in EITC benefit that stems from the level of or change in family income. The combination of constant baseline family structure and size with the instrument control function ensures that only exogenous variation in the available EITC benefit in the state and year is used to predict family income. By addressing the issues of time, location, family structure and size, and income level, we argue that the third assumption for a valid instrument is met.

We estimated pooled and fixed-effects two-stage least squares regressions. The first stage model, in OLS form, is:

$$NET_{i,w} = \alpha + \theta_3 EITC_{i,\,w} + \beta_6 X_{i,w} + \varphi_1 ZERO_{i,\,w-1} + \varphi_2\, INC_{i,\,w-1} + \varphi_3 INC^2_{i,\,w-1} \ldots + \varphi_6 INC^6_{i,\,w-1} + \varepsilon_i \quad (1)$$

Where θ_3 is the coefficient for the effect of EITC on net income, and $\varphi_1$though φ_6 represent the control function for the instrument. The predicted value of *NET* is then used in place of observed net income in the second stage equation:

$$\Pr\left(Y_{i,w}\right) = \alpha + \omega_1 \widehat{NET}\ln_{i,\,w} + \beta_7 X_{i,w} + \varphi_1 ZERO_{i,\,w-1} + \varphi_2\, INC_{i,\,w-1} + \varphi_3 INC^2_{i,\,w-1} \ldots + \varphi_6 INC^6_{i,\,w-1} + \varepsilon_i \quad (2)$$

The coefficient ω_1 represents the exogenous effect of net income on the probability of experiencing a given maltreatment outcome (*Y*).

The validity of our IV strategy is dependent on “controlling flexibly for pretax income with the control function” (Dahl & Lochner, 2012, p. 1936). The control function ensures that variation in the instrument is derived from variation in EITC benefit availability across states and over time only, and not by changes in family structure and size or work behavior (earnings), assuming that the association between the average of current and lagged pretax income and CPS-involvement is stable over time. Furthermore, this strategy serves to reduce attenuation bias due to measurement error in income as well as to guard against bias due to changes in income over time that are correlated with age and likely reflect measurement

error, regression to the mean, and serially correlated income shocks (Dahl & Lochner, 2012; see also Gruber & Saez, 2002; Heckman & Robb, 1985). For these reasons, the IV strategy is our preferred specification. Additionally, given prior evidence that the EITC is most beneficial for single-mother families and families with two or more children, we estimated separate models by family structure and whether there is one or more than one child in the household at baseline (age 3).

We next present results from a series of robustness checks. We first estimated pooled cross-sectional OLS regressions and OLS regressions with family-specific fixed-effects to assess the association between net income and CPS involvement. The pooled OLS model, with standard errors clustered at the family level, is of the basic form:

$$\Pr(Y_{i,w}) = \alpha + \delta_1 NET_{i,w} + \beta_1 X_{i,w} + \varepsilon_i \quad (3)$$

where Y is whether maltreatment occurred for mother i at wave w; NET is net income; and X is a vector of observed characteristics. We then estimated the association between a change in net income and a change in maltreatment, using OLS regressions with family fixed effects and robust standard errors. This model takes the form:

$$\Delta\Pr(Y_i) = \alpha + \delta_2 \Delta NET_i + \beta_2 \Delta X_i + \varepsilon_i \quad (4)$$

We present results from four specifications of the pooled OLS model. The first included only the income measures and not the covariates. The full set of covariates including region of residence was added in the second model, the average of current and lagged income in the third, and state fixed effects in the fourth. We present results for the fixed effects regressions based on Model 3, which controls for the full set of covariates. We did not include state fixed effects in these models because very few families changed state of residence during the observation period.

Second, we present results from reduced form models in which we regressed each outcome on the maximum EITC potentially available to the family in a given state and year, rather than on family income. The reduced-form strategy allows us to examine whether there is a direct association of the generosity of the EITC to which a family is subject with the likelihood that the family engages in maltreatment. This model, in OLS estimation, takes the form:

$$\Pr(Y_{i,w}) = \alpha + \theta_1 EITC_{i,w} + \beta_3 X_{i,w} + \varepsilon_i \quad (5)$$

where a given maltreatment outcome (Y) is regressed on all covariates (X) and the estimated EITC benefit for which a family is eligible ($EITC$), with income excluded from the model.

Next, we present results from regressions using a control function that provides information about the direction and magnitude of bias in our OLS estimates. Consider the equation:

$$NET_i = \alpha + \theta_3 EITC_{i,w} + \beta_4 X_{i,w} + \varepsilon_i \quad (6)$$

where net (post tax and transfer) income is regressed on the estimated EITC amount and all controls. This equation is similar to the first stage equation in the IV approach. Here, however, rather than forwarding the predicted value of *NET* to a second stage equation, we forward the residual from this equation. The residual represents the difference between the actual and predicted values of net family income—a difference that is likely caused by omitted variables that threaten to bias the estimated effect of income on maltreatment. The residual is simply used as a covariate in a standard regression model. The OLS version of this model is estimated by:

$$\Pr(Y_i) = \alpha + \delta_3 NET_{i,w} + \vartheta_1 \left(NET_{i,w} - \widehat{NET}_{i,w} \right) + \beta_5 X_{i,w} + \varepsilon_i \quad (7)$$

V. Results

Descriptive statistics

Descriptive statistics are presented in Table 3. Overall, 7.5% of the sample experienced a CPS investigation. Approximately 33% of non-CPS-involved families exhibited behaviorally-approximated abuse and 35% exhibited behaviorally approximated neglect. Rates for CPS-involved families were 49% and 47%, respectively. Whereas these rates are quite high, they reflect both that our sample consists of disadvantaged, low-income unmarried families and that the measures capture maltreatment risk rather than behaviors that meet legal standards. The descriptive statistics further indicate that non-CPS-involved families had modestly higher incomes than non-involved families, although average income was quite low for both groups. EITC benefits were estimated to be statistically equivalent. About 87% of non-CPS-involved and 82% of CPS-involved families had some earnings (not shown). Moreover, mothers in non-CPS-involved families generally had fewer biological children and fewer adults in the household than those in CPS-involved families. Families in the south were disproportionately likely, and families in the west (California) disproportionately unlikely to have been investigated.

Regression results

Our first-stage IV results are presented in Table 4. In all cases, the instrument performed exceptionally well, exceeding the critical values for weak identification (as suggested by Stock & Yogo, 2005). This indicates that the potential EITC benefit available to a family is highly predictive of family income. The estimates indicate that a $1,000 increase in the potential EITC benefit available to a family is roughly associated with a $936 to $1,030 increase in income.

The second-stage results (Table 5) are suggestive of negative associations between income and each of the maltreatment measures prior to the inclusion of family fixed effects. However, once the family fixed effects are included, the income coefficient reverses

direction for behaviorally approximated abuse. All of the CPS investigation and neglect coefficients are negative and, in the models without family fixed effects, the CPS coefficients are marginally significant. The neglect coefficient is essentially reduced to zero in the fixed effects model.

Table 6 presents regression results for single-mother (non-cohabiting) families and for families with two or more children at the age 3 observation (baseline).[8] Our estimates support the hypothesis that the benefits of the EITC are most prominent for single-mother and larger families. Indeed, the link between income and both behaviorally-approximated neglect and CPS involvement is particularly strong for to these groups. Specifically, it is negative and at least marginally significant for all of the IV models for single mothers and several of the IV models for families with multiple children. In terms of effect size, we find, for example, a $1,000 increase in income to be associated with roughly a 1.0 to 1.2 percentage point (3% to 4%) decrease in behaviorally-approximated neglect and a .58 to .70 percentage point (8% to 10%) decrease in CPS involvement among low-income single-mother families.[9]

Table 7 shows results from standard OLS (linear probability) regressions, OLS regressions with individual-specific fixed effects, reduced form, and control function models (each with and without individual-specific fixed effects). The OLS results reveal consistently significant negative associations of income with behaviorally-approximated child neglect, but not with abuse. We also see a significant negative association of income with CPS involvement prior to controlling for the average of current and lagged income. Whereas this association remains negative after we do so, it is no longer significant. Of particular note, the coefficients in these models are smaller in magnitude than those in the IV models, suggesting that the OLS coefficients for both neglect and CPS involvement are downwardly biased.

The OLS estimates when family-specific fixed effects are included are smaller and non-significant. Nearly all of the reduced form estimates are negative, suggesting that EITC generosity is inversely associated with maltreatment. These estimates are considerably larger than those from the linear probability models (with and without fixed effects). At the same time, only the neglect estimates for models that do not include family fixed effects attain (marginal) statistical significance. The control function results are consistent with those from the reduced form models, although the coefficients are smaller in magnitude. The coefficients in both the reduced form and control function models are larger than those in the

[8]IV results for cohabiting families and families with only one child at baseline (age 3) are presented in Appendix 4. We also estimated a series of robustness checks using the sample of single-mother families at age 3, including (1) limiting the sample to currently unmarried mothers, to currently single (non-cohabiting) mothers, to always unmarried mothers, to always unmarried currently single mothers, to always single mothers, to single mother with two or more children, to single mother families at age 3 with non-imputed income, and to always single-mother families with non-imputed income. Each of these analyses produced results that are substantively consistent with those from our primary models although estimates in some cases were less likely to attain statistical significance due to reduced sample size and associated lack of statistical power. See Appendix 5.

[9]We also estimated supplemental models using alternative specifications of the behaviorally-approximated abuse and neglect measures, including dichotomous measures that a family scored more than half of a standard deviation above the sample mean for abuse or neglect, and continuous measures of the abuse and neglect indices (standardized to have a mean of 0 and standard deviation of 1). These results (see Appendices 6 and 7, respectively) were consistent with those from our primary analyses.

OLS models (without the inclusion of fixed-effects), again suggesting that the OLS coefficients are downwardly biased.

VI. Discussion

We find that, at least among single-mother families and, to a slightly lesser extent, families with greater number of children, our (preferred) IV specification produces larger and more frequently significant estimates of the effect of income on behaviorally-approximated neglect and CPS involvement than models that less rigorously address selection. Indeed, the IV results for single-mother families suggest significant, small to modest decreases in behaviorally-approximated neglect and modestly large decreases in CPS involvement per a $1000 exogenous increase in income, whereas estimates from the more naive models suggests smaller declines. This may be the case for three reasons. First, the OLS estimates may reflect greater attenuation bias due to measurement error in income. Second, the link between income and child maltreatment may be strongest among relatively lower-income families such that the local average treatment effect produced by our IV strategy is most relevant to such families. Finally, permanent increases in income are thought to have larger influences on family wellbeing than temporary shocks. As such, if EITC expansions reflect relatively permanent income increases rather than temporary income shocks, the IV estimates should be larger than the OLS estimates. We find no evidence of a causal link between income and child abuse.

The general pattern of our results is suggestive of a causal link between income and both child neglect and CPS involvement, at least among single-mother and possibly larger families, which benefit most from the EITC. Moreover, the absence of statistical significance from many of the second stage IV results does not necessarily indicate a lack of a causal relation. The IV strategy is primarily intended to detect bias in the size and direction of the coefficients produced by more naïve models. Indeed, because the variance of the IV estimator is larger than that of the OLS estimator (as the former uses only a portion of the variance in the instrumented variable) the method tends to produce large second stage standard errors; this “is the price paid for avoiding the asymptotic bias of OLS” (Kennedy, 2008, p. 141). Thus, despite that our IV estimates are not always statistically significant, they consistently indicate that the OLS estimates are downwardly biased, at least with respect to the neglect and CPS outcomes.

Several caveats should be considered when interpreting out results. First, the generalizability of our findings is limited to relatively disadvantaged urban families whose incomes are potentially affected by EITC benefit generosity. Second, whereas there is adequate EITC variation across states and over time to support our identification strategy, many of the largest EITC expansions occurred in the 1990s, before the FFCW study began. We cannot be certain that the same results would be found using data from earlier time periods. Finally, because our measure of CPS involvement is self-reported, it may be subject to social desirability (and, therefore, underreporting) bias as well as faulty or incomplete recollection of events. In addition, CPS-investigation was only measured at the age 5 and age 9 interviews and, at each time point, dates were provided only for the most recent

investigation. Thus, we likely underestimate of CPS investigations, and particularly recurrent and early contacts.

Additional research is needed to achieve a more complete understanding of whether links between income and child maltreatment are causal and, thereby, whether economic support policies may reduce maltreatment and CPS involvement. Such research should also focus on the mechanisms through which income may influence maltreatment risk. Given the high public and private cost of child maltreatment, the extensive body of literature documenting that low-income families are disproportionately likely to come to the attention of CPS, and the efficiency associated with direct cash transfers like the EITC, such research is crucial to informing policy. It is well known that, in addition to being disproportionately low income, families at risk of maltreatment and CPS involvement are disproportionately characterized by a host of other risk factors, including poor parenting skills and knowledge of child development, substance abuse, mental health problems, criminal justice involvement, cognitive impairments, poor health, and residence in disadvantaged neighborhoods. Many of these problems are relatively intractable; they are difficult to ameliorate and treatment is often prolonged and expensive (if even available), and many families fail to take-up or comply with treatment. As such, if a causal link between income and maltreatment exists—which is cautiously suggested by our results—then economic support may be an additional tool for preventing child maltreatment.

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Appendix 1. Comparison of non-imputed and imputed descriptive statistics

	Full sample (with imputed values)	Complete case sample (excludes missings)	Analysis sample (excludes married and high-income parents)
Observations	*14694*	*8540*	*4040*
Maltreatment			
CPS investigation	4.1%	5.7%	7.5%
Abuse (continuous)	5.13 (.112)	5.23 (.105)	6.21 (.169)
Neglect (continuous)	.43 (.010)	.42 (.009)	.54 (.014)
Income measures (in thousands)			
Net income	4.02 (.333)	4.20 (.407)	2.69 (.200)
EITC	1.35 (.018)	1.35 (.019)	1.98 (.030)
Lagged pretax income	42.52 (.398)	42.53 (.500)	18.92 (.187)

	Full sample (with imputed values)	Complete case sample (excludes missings)	Analysis sample (excludes married and high-income parents)
Covariates measured at baseline			
Married	29.2%	32.1%	.00%
White	21.7%	22.3%	11.6%
Black	47.2%	5.2%	64.4%
Hispanic	27.2%	24.4%	22.4%
Other race	3.9%	3.1%	1.61%
Less than HS	34.7%	32.2%	44.9%
HS only	3.3%	31.2%	35.5%
More than HS	35.0%	36.6%	19.6%
No. Children	2.158 (.011)	2.304 (.014)	2.41 (.023)
Time-Varying Covariates			
Single	51.4%	40.3%	59.8%
Cohabiting	20.0%	24.8%	33.0%
Married	28.6%	34.9%	7.2%
Age of youngest child	3.13 (.021)	2.22 (.018)	2.28 (.028)
No. adults in household	2.00 (.007)	1.99 (.009)	1.83 (.014)
Age of mother	3.99 (.050)	3.91 (.071)	29.63 (.098)
Northeast	41.4%	41.9%	42.9%
South	19.6%	18.8%	16.4%
Midwest	25.6%	29.1%	32.5%
California	13.4%	1.2%	8.19%
Age 3 interview	33.3%	32.7%	32.4%
Age 5 interview	33.3%	33.1%	33.7%
Age 9 interview	33.3%	34.3%	33.9%
Unemployment rate	.10 (.001)	.10 (.001)	.12 (.001)
Public assistance rate	.07 (.001)	.07 (.001)	.09 (.001)

Note: Means (and standard deviations) or percent presented.

Appendix 2. Regression results using the sample of mothers with no more than a high school degree

	Abuse	Neglect	CPS Investigation
Full sample (4,236 observations of 1,828)			
Percent	33.45	34.44	6.59
Control function:			
Model 3: All controls (ln income estimate presented)	.0373 (.0949)	−.0367 (.0931)	−.0338 (.0475)

	Abuse	Neglect	CPS Investigation
Model 4: Add state fixed effects (ln income estimate presented)	.0562 (.0948)	−.0346 (.0937)	−.0344 (.0477)
Model 5: With family fixed effects (ln income estimate presented)	.1218 (.1025)	.0464 (.1140)	−.0452 (.0634)
IV (second stage):			
Model 3: All controls (ln income estimate presented)	−.0558 (.1114)	−.0871 (.1130)	−.1018 + (.0579)
F-statistic (first stage)	240.97	240.97	240.97
Model 4: Add state fixed effects (ln income estimate presented)	−.0086 (.1112)	−.0758 (.1135)	−.0991 + (.0583)
F-statistic (first stage)	231.94	231.94	231.94
Model 5: With family fixed effects (ln income estimate presented)	.1992 (.1248)	.0825 (.1356)	−.0749 (.0797)
F-statistic (first stage)	131.85	131.85	131.85
Single-mother families at age 3 (2,503 observations of 1,099)			
Percent	35.72	37.28	6.71
Control function:			
Model 3: All controls (ln income estimate presented)	−.0510 (.1284)	−.2641 * (.1221)	−.0379 (.0605)
Model 4: Add state fixed effects	−.0426	−.2591 *	−.0332
(ln income estimate presented)	(.1280)	(.1230)	(.0610)
Model 5: With family fixed effects (ln income estimate presented)	.1530 (.1379)	−.2086 (.1479)	−.0709 (.0790)
IV (second stage):			
Model 3: All controls (ln income estimate presented)	−.1315 (.1289)	−.3141 * (.1282)	−.1018 + (.0612)
F-statistic (first stage)	231.43	231.43	231.43
Model 4: Add state fixed effects (ln income estimate presented)	−.0949 (.1288)	−.3035 * (.1294)	−.0968 (.0617)
F-statistic (first stage)	223.50	223.50	223.50
Model 5: With family fixed effects (ln income estimate presented)	.1351 (.1353)	−.1994 (.1486)	−.0983 (.0841)
F-statistic (first stage)	123.30	123.30	123.30

Note: Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test, for which the critical values are 16.38, 8.96, 6.66, and 5.53 (corresponding to 10%, 15%, 20% and 25% maximum relative bias, respectively; Stock & Yogo, 2005).

+ p<.10

* p<.05

** p<.01

*** p<.001

Appendix 3. Regression results using the sample of families below 130% of poverty

	Abuse	Neglect	CPS Investigation
Full sample (3,657 observations of 1,515)			
Percent	33.99	35.68	7.96
Control function:			
Model 3: All controls (ln income estimate presented)	−.0051 (.0041)	−.0083^{+} (.0043)	−.0008 (.0023)
Model 4: Add state fixed effects (ln income estimate presented)	−.0039 (.0042)	−.0087* (.0043)	−.0010 (.0024)
Model 5: With family fixed effects (ln income estimate presented)	−.0008 (.0059)	−.0001 (.0065)	−.0024 (.0040)
IV (second stage):			
Model 3: All controls (ln income estimate presented)	−.0117* (.0058)	−.0065 (.0059)	−.0032 (.0033)
F-statistic (first stage)	57.87	57.87	57.87
Model 4: Add state fixed effects (ln income estimate presented)	−.0088 (.0058)	−.0070 (.0060)	−.0034 (.0033)
F-statistic (first stage)	53.52	53.52	53.52
Model 5: With family fixed effects (ln income estimate presented)	.0029 (.0076)	.0035 (.0084)	−.0020 (.0053)
F-statistic (first stage)	17.43	17.43	17.43
Single-mother families at age 3 (2,331 observations of 952)			
Percent	35.52	37.67	8.37
Control function:			
Model 3: All controls (ln income estimate presented)	−.0056 (.0054)	−.0166** (.0053)	−.0017 (.0029)
Model 4: Add state fixed effects (ln income estimate presented)	−.0044 (.0055)	−.0167** (.0054)	−.0016 (.0030)
Model 5: With family fixed effects (ln income estimate presented)	−.0005 (.0078)	−.0093 (.0083)	−.0070 (.0049)
IV (second stage):			
Model 3: All controls (ln income estimate presented)	−.0121* (.0060)	−.0164** (.0061)	−.0039 (.0032)
F-statistic (first stage)	289.71	289.71	289.71
Model 4: Add state fixed effects (ln income estimate presented)	−.0092 (.0061)	−.0164** (.0063)	−.0039 (.0033)
F-statistic (first stage)	272.86	272.86	272.86
Model 5: With family fixed effects (ln income estimate presented)	−.0009 (.0064)	−.0079 (.0071)	−.0053 (.0044)
F-statistic (first stage)	38.39	38.39	38.39

Note: 3,657 family-wave observations of 1,515 families. Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test, for which the critical values are 16.38, 8.96, 6.66, and 5.53 (corresponding to 10%, 15%, 20% and 25% maximum relative bias, respectively; Stock & Yogo, 2005).

$^{+}$p<.10

*p<.05

** p<.01
*** p<.001

Appendix 4. IV results for cohabiting families and families with one child at age 3 (baseline)

	Abuse	Neglect	CPS Investigation
Cohabiting-family at age 3 (1,459 observations of 623 families)			
Percent	31.39	31.73	7.20
Model 3: All controls (income estimate presented)	−.0014 (.0090)	.0141 (.0097)	−.0008 (.0056)
F-statistic (first stage)	44.75	44.75	44.75
Model 4: Add state fixed effects (income estimate presented)	−.0013 (.0086)	.0145 (.0093)	−.0018 (.0054)
F-statistic (first stage)	44.05	44.05	44.05
Model 5: With family fixed effects (income estimate presented)	.0066 (.0143)	.0370 + (.0197)	.0125 (.0106)
F-statistic (first stage)	21.88	21.88	21.88
One child (1,202 observations of 574 families)			
Percent	33.11	35.19	4.66
Model 3: All controls (income estimate presented)	.0056 (.0173)	.0098 (.0173)	.0019 (.0088)
F-statistic (first stage)	10.49	10.49	10.49
Model 4: Add state fixed effects (income estimate presented)	.0093 (.0181)	.0126 (.0184)	.0016 (.0090)
F-statistic (first stage)	8.79	8.79	8.79
Model 5: With family fixed effects (income estimate presented)	0.1229 (0.4627)	0.0490 (0.2288)	0.0880 (0.2979)
F-statistic (first stage)	0.08	0.08	0.08

Note: Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test for instrumental variables. All IV models families meet the critical value of 16.38 (corresponding to a 10% maximum relative bias; Stock & Yogo, 2005).

+ p<.10
* p<.05
** p<.01
*** p<.001

Appendix 5. IV results for robustness checks using single-mother families at age 3 (baseline)

	Abuse	Neglect	CPS Investigation
Single-mother family at age 3, currently unmarried (2,444 observations of 1,090 families)			
Percent	35.97	38.30	7.69

	Abuse	Neglect	CPS Investigation
Model 3: All controls (income estimate presented)	−0.0068 (0.0049)	−0.0129 ** (0.0049)	−0.0048 + (0.0025)
F-statistic (first stage)	114.32	114.32	114.32
Model 4: Add state fixed effects (income estimate presented)	−0.0049 (0.0050)	−0.0132 ** (0.0050)	−0.0047 + (0.0026)
F-statistic (first stage)	136.78	136.78	136.78
Model 5: With family fixed effects (income estimate presented)	0.0054 (0.0055)	−0.0112 + (0.0059)	−0.0054 (0.0036)
F-statistic (first stage)	68.10	68.10	68.10
Single-mother family at age 3, currently single (2,044 observations of 1,021 families)			
Percent	36.11	39.43	6.95
Model 3: All controls (income estimate presented)	−0.0095 + (0.0056)	−0.0157 ** (0.0055)	−0.0062 * (0.0027)
F-statistic (first stage)	94.24	94.24	94.24
Model 4: Add state fixed effects (income estimate presented)	−0.0083 (0.0056)	−0.0160 ** (0.0055)	−0.0062 * (0.0028)
F-statistic (first stage)	112.74	112.74	112.74
Model 5: With family fixed effects (income estimate presented)	0.0059 (0.0070)	−0.0082 (0.0072)	−0.0060 (0.0041)
F-statistic (first stage)	37.08	37.08	37.08
Single-mother family at age 3, always unmarried (2,324 observations of 1,037 families)			
Percent	36.45	38.34	7.57
Model 3: All controls (income estimate presented)	−0.0078 (0.0051)	−0.0130 * (0.0050)	−0.0043 + (0.0025)
F-statistic (first stage)	106.73	106.73	106.73
Model 4: Add state fixed effects (income estimate presented)	−0.0058 (0.0051)	−0.0131 * (0.0051)	−0.0041 (0.0026)
F-statistic (first stage)	102.82	102.82	102.82
Model 5: With family fixed effects (income estimate presented)	0.0043 (0.0056)	−0.0103 + (0.0059)	−0.0055 (0.0036)
F-statistic (first stage)	66.31	66.31	66.31
Never married family, currently single-mother family (1,952 observations of 974 families)			
Percent	36.68	39.40	6.76
Model 3: All controls (income estimate presented)	−0.0110 + (0.0058)	−0.0160 ** (0.0057)	−0.0058 * (0.0027)
F-statistic (first stage)	87.19	87.19	87.19
Model 4: Add state fixed effects (income estimate presented)	−0.0095 (0.0058)	−0.0162 ** (0.0057)	−0.0056 * (0.0028)
F-statistic (first stage)	85.10	85.10	85.10
Model 5: With family fixed effects (income estimate presented)	0.0040 (0.0070)	−0.0075 (0.0071)	−0.0064 (0.0041)
F-statistic (first stage)	37.19	37.19	37.19
Always single-mother family (1,572 observations of 764 families)			
Percent	37.09	39.95	6.68
Model 3: All controls (income estimate presented)	−0.0139 + (0.0071)	−0.0165 * (0.0069)	−0.0069 * (0.0033)
F-statistic (first stage)	62.50	62.50	62.50

	Abuse	Neglect	CPS Investigation
Model 4: Add state fixed effects (income estimate presented)	−0.0126 + (0.0072)	−0.0167 * (0.0069)	−0.0068 * (0.0034)
F-statistic (first stage)	60.22	60.22	60.22
Model 5: With family fixed effects (income estimate presented)	0.0056 (0.0091)	−0.0103 (0.0092)	−0.0078 (0.0052)
F-statistic (first stage)	23.75	23.75	23.75
Single-mother family with two or more children at age 3 (1,788 observations of 735 families)			
Model 3: All controls (income estimate presented)	−0.0085 + (0.0052)	−0.0144 ** (0.0053)	−0.0071 * (0.0029)
F-statistic (first stage)	113.18	113.18	113.18
Model 4: Add state fixed effects (income estimate presented)	−0.0067 (0.0051)	−0.0144 ** (0.0054)	−0.0071 * (0.0029)
F-statistic (first stage)	109.77	109.77	109.77
Model 5: With family fixed effects (income estimate presented)	0.0040 (0.0052)	−0.0086 (0.0057)	−0.0061 (0.0037)
F-statistic (first stage)	68.66	68.66	68.66
Single-mother family at age 3, exclude cases with imputed income (2,378 observations of 1,028 families)			
Percent	36.08	37.89	7.78
Model 3: All controls (income estimate presented)	−0.0067 (0.0048)	−0.0129 ** (0.0049)	−0.0052 * (0.0026)
F-statistic (first stage)	34.56	34.56	34.56
Model 4: Add state fixed effects (income estimate presented)	−0.0044 (0.0048)	−0.0127 * (0.0049)	−0.0053 * (0.0026)
F-statistic (first stage)	30.25	30.25	30.25
Model 5: With family fixed effects (income estimate presented)	0.0044 (0.0057)	−0.0128 + (0.0066)	−0.0057 (0.0039)
F-statistic (first stage)	10.92	10.92	10.92
Always single-mother family, exclude cases with imputed income (1,440 observations of 695 families)			
Percent	37.85	39.79	6.74
Model 3: All controls (income estimate presented)	−0.0110 (0.0069)	−0.0165 * (0.0068)	−0.0063 + (0.0034)
F-statistic (first stage)	79.04	79.04	79.04
Model 4: Add state fixed effects (income estimate presented)	−0.0095 (0.0069)	−0.0164 * (0.0068)	−0.0062 + (0.0034)
F-statistic (first stage)	62.55	62.55	62.55
Model 5: With family fixed effects (income estimate presented)	0.0090 (0.0097)	−0.0107 (0.0103)	−0.0071 (0.0054)
F-statistic (first stage)	20.41	20.41	20.41

Note: Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test for instrumental variables. All IV models families meet the critical value of 16.38 (corresponding to a 10% maximum relative bias; Stock & Yogo, 2005).

+ p<.10
* p<.05
** p<.01
*** p<.001

Appendix 6. IV results using .50 SD thresholds of abuse and neglect measures

	Abuse .50 SD threshold	Neglect .50 SD threshold
Full sample (4,040 observations of 1,750 families)		
Percent	17.15	35.72
Model 3: All controls (income estimate presented)	−.0056 (.0036)	−.0049 (.0044)
F-statistic (first stage)	222.69	222.69
Model 4: Add state fixed effects (income estimate presented)	−.0043 (.0035)	−.0050 (.0044)
F-statistic (first stage)	215.78	215.78
Model 5: With family fixed effects (income estimate presented)	−.0003 (.0045)	−.0000 (.0060)
F-statistic (first stage)	141.04	141.04
Single-mother families at age 3(2,581 observations of 1,127 families)		
Percent	18.21	37.97
Model 3: All controls (income estimate presented)	−.0086 * (.0039)	−.0122 * (.0049)
F-statistic (first stage)	194.72	194.72
Model 4: Add state fixed effects (income estimate presented)	−.0033 (.0028)	−.0105 ** (.0036)
F-statistic (first stage)	225.29	225.29
Model 5: With family fixed effects (income estimate presented)	−.0033 (.0046)	−.0103 + (.0062)
F-statistic (first stage)	138.65	138.65

Note: 4,040 family-wave observations of 1,750 families. Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test, for which the critical values are 16.38, 8.96, 6.66, and 5.53 (corresponding to 10%, 15%, 20% and 25% maximum relative bias, respectively; Stock & Yogo, 2005).

+ p<.10
* p<.05
** p<.01
*** p<.001

Appendix 7. IV results using continuous abuse and neglect measures

	Abuse	Neglect
Full sample (4,040 observations of 1,750 families)		
Mean	.037	.070
(SD)	(1.047)	(1.073)
Model 3: All controls (income estimate presented)	−.0139 (.0100)	.0073 (.0100)
F-statistic (first stage)	222.69	222.69

	Abuse	Neglect
Model 4: Add state fixed effects (income estimate presented)	−.0095 (.0097)	.0052 (.0100)
F-statistic (first stage)	215.78	215.78
Model 5: With family fixed effects (income estimate presented)	.0071 (.0121)	.0225 + (.0128)
F-statistic (first stage)	141.04	141.04
Single-mother families(2,581 observations of 1,127 families)		
Mean	.063	.100
(SD)	(1.052)	(1.081)
Model 3: All controls (income estimate presented)	−.0215 * (.0103)	−.0080 (.0110)
F-statistic (first stage)	194.72	194.72
Model 4: Add state fixed effects (income estimate presented)	−.0060 (.0073)	−.0145 + (.0084)
F-statistic (first stage)	225.29	225.29
Model 5: With family fixed effects (income estimate presented)	−.0011 (.0120)	−.0008 (.0124)
F-statistic (first stage)	138.65	138.65

Note: Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test, for which the critical values are 16.38, 8.96, 6.66, and 5.53 (corresponding to 10%, 15%, 20% and 25% maximum relative bias, respectively; Stock & Yogo, 2005).

+ p<.10

* p<.05

** p<.01

*** p<.001

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Table 1

Maximum Federal and State EITC Benefits by Year

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Maximum Federal EITC										
1 child	$2,353	$2,428	$2,506	$2,547	$2,604	$2,662	$2,747	$2,853	$2,917	$3,043
2 children	$3,888	$4,008	$4,140	$4,204	$4,300	$4,400	$4,536	$4,716	$4,824	$5,028
3 children	$3,888	$4,008	$4,140	$4,204	$4,300	$4,400	$4,536	$4,716	$4,824	$5,657
State EITC as a Percentage of Federal EITC										
CA	–	–	–	–	–	–	–	–	–	–
TX	–	–	–	–	–	–	–	–	–	–
MD[a]	15%	16%	16%	18%	20%	20%	20%	20%	25%	25%
MI	–	–	–	–	–	–	–	–	10%	20%
NJ	10%	15%	18%	20%	20%	20%	20%	20%	23%	25%
PA	–	–	–	–	–	–	–	–	–	–
VA	–	–	–	–	–	–	20%	20%	20%	20%
IN	–	–	–	6%	6%	6%	6%	6%	6%	9%
NY	23%	25%	28%	30%	30%	30%	30%	30%	30%	30%
MA	10%	15%	15%	15%	15%	15%	15%	15%	15%	15%
TN	–	–	–	–	–	–	–	–	–	–
IL	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
FL	–	–	–	–	–	–	–	–	–	–
OH	–	–	–	–	–	–	–	–	–	–
WI – 1 child	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
WI – 2 children	14%	14%	14%	14%	14%	14%	14%	14%	14%	14%
WI – 3 children	43%	43%	43%	43%	43%	43%	43%	43%	43%	43%

[a]The Maryland EITC is non-refundable.

Table 2

Simulated Total (State and Federal) EITC for Single Filers with 2 Children by State, Year, and Earnings

	$15,000			$30,000		
State	**2001 EITC**	**2005 EITC**	**2009 EITC**	**2001 EITC**	**2005 EITC**	**2009 EITC**
No State EITC	4,855	4,833	5,028	1,877	1,840	2,168
MD	7,879	8,042	8,690	2,815	2,760	3,252
MI	4,855	4,833	6,034	1,877	1,840	2,602
NJ	5,584	5,800	6,285	1,877	1,840	2,710
VA	4,855	4,833	6,034	1,877	1,840	2,602
IN	4,855	5,123	5,481	1,877	1,950	2,363
NY	6,011	6,231	6,489	2,297	2,365	2,818
MA	5,584	5,558	5,782	2,158	2,116	2,493
IL	5,087	5,075	5,279	1,971	1,932	2,276
WI	5,535	5,510	5,732	2,139	2,097	2,472

Note: Earnings and EITC amounts are in 2009 dollars.

Table 3

Descriptive statistics

	No CPS Investigation	CPS Investigation	
Maltreatment measures (top quartile):			
Abuse	0.327	0.485	***
Neglect	0.348	0.468	***
Income and potential EITC benefit (in thousands):			
Income	20.812 (12.713)	19.142 (12.247)	*
Potential EITC benefit (instrument)	1.984 (1.884)	1.930 (1.904)	
Time constant covariates:			
White	0.102	0.159	**
Black	0.647	0.595	+
Hispanic	0.224	0.223	
Other race	0.016	0.020	
Less than HS education	0.450	0.429	
HS education	0.354	0.352	
More than HS education	0.195	0.216	
Number of children in the home at child age 3	2.374 (1.416)	2.910 (1.594)	***
South	0.159	0.219	**
Midwest	0.324	0.339	
Northeast	0.431	0.402	
West (California)	0.085	0.040	**
Time varying covariates:			
Married	.073	.059	
Cohabiting	.332	.306	
Single	.595	.635	
Age of youngest child	2.275 (1.752)	2.369 (1.995)	
Number of adults in the home	1.840 (0.914)	1.747 (0.846)	+
Number of children in the home	2.612 (1.430)	3.216 (1.658)	***
Mother’s age	29.607 (6.275)	29.870 (5.776)	
No income	0.015	0.010	
Average of lagged and current income	19.091 (12.003)	16.852 (9.868)	**
Unemployment rate	0.121 (0.075)	0.120 (0.074)	
Public assistance rate	0.091 (0.070)	0.091 (0.072)	
Wave 3	0.339	0.143	***
Wave 4	0.323	0.508	***

	No CPS Investigation	CPS Investigation
Wave 5	0.338	0.349
Percent of full sample	92.55	7.45
Observations	3,739	301

Note: 4,040 family-wave observations of 1,750 families. Proportion or mean (and standard deviation) presented.

$^{+}$ p<.10,

* p<.05,

** p<.01,

*** p<.001.

Table 4

First-stage IV results

	Model 3: All controls	Model 4: Add state fixed effects	Model 5: With family fixed effects
Simulated EITC benefit	1.023***	1.030***	.936***
	(.082)	(.083)	(.125)
Kleibergen-Paap weak identification test (*F*)	222.69	215.78	141.04

Note: 4,040 family-wave observations of 1,750 families. Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. For these models, the values of the Kleibergen-Paap weak identification test all exceed the critical value of 16.38 (corresponding to a 10% maximum relative bias; Stock & Yogo, 2005).

+ p<.10

* p<.05

** p<.01

*** p<.001

Table 5

Second-stage IV results

	Abuse	Neglect	CPS Investigation
Percent	33.91	35.72	7.45
Model 3: All controls (income estimate presented)	−.0054 (.0043)	−.0049 (.0044)	−.0045 + (.0024)
Model 4: Add state fixed effects (income estimate presented)	−.0037 (.0043)	−.0050 (.0044)	−.0045 + (.0025)
Model 5: With family fixed effects (income estimate presented)	.0053 (.0055)	−.0000 (.0060)	−.0027 (.0038)

Note: 4,040 family-wave observations of 1,750 families. Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects.

+ p<.10

* p<.05

** p<.01

*** p<.001

Table 6

IV results for single-mother families and families with two or more children at age 3 (baseline)

	Abuse	Neglect	CPS Investigation
Single-mother families (2,581 observations of 1,127 families)			
Percent	35.34	37.97	7.59
Model 3: All controls (income estimate presented)	−.0069 (.0048)	−.0122* (.0049)	−.0058* (.0025)
F-statistic (first stage)	194.72	194.72	194.72
Model 4: Add state fixed effects (income estimate presented)	−.0048 (.0049)	−.0124* (.0050)	−.0058* (.0026)
F-statistic (first stage)	186.07	186.07	186.07
Model 5: With family fixed effects (income estimate presented)	.0050 (.0056)	−.0103+ (.0062)	−.0070+ (.0038)
F-statistic (first stage)	138.65	138.65	138.65
Two or more children (2,838 observations of 1,176 families)			
Percent	34.25	35.94	8.63
Model 3: All controls (income estimate presented)	−.0087* (.0043)	−.0065 (.0045)	−.0063* (.0025)
F-statistic (first stage)	120.14	120.14	120.14
Model 4: Add state fixed effects (income estimate presented)	−.0075+ (.0042)	−.0073 (.0045)	−.0062* (.0025)
F-statistic (first stage)	144.10	144.10	144.10
Model 5: With family fixed effects (income estimate presented)	.0032 (.0048)	−.0007 (.0053)	−.0037 (.0034)
F-statistic (first stage)	69.40	69.40	69.40

Note: Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 3 includes all time constant and time varying covariates as well as the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects. The first stage F statistics are from the Kleibergen-Paap weak identification test for instrumental variables. All IV models families meet the critical value of 16.38 (corresponding to a 10% maximum relative bias; Stock & Yogo, 2005).

+ p<.10

* p<.05

** p<.01

*** p<.001

Table 7

OLS, fixed-effects, reduced form, and control function regression results

	Abuse	Neglect	CPS Investigation
Percent	33.91	35.72	7.45
OLS:			
Model 1: income only (income estimate presented)	−.0003 (.0006)	−.0035*** (.0006)	−.0007* (.0003)
Model 2: Add covariates (income estimate presented)	.0003 (.0007)	−.0034*** (.0007)	−.0008* (.0004)
Model 3: Add lagged income (income estimate presented)	.0001 (.0009)	−.0031*** (.0009)	−.0001 (.0005)
Model 4: Add state fixed effects (income estimate presented)	.0001 (.0009)	−.0031*** (.0009)	−.0002 (.0005)
Fixed effects:			
Model 5: All controls (income estimate presented)	−.0006 (.0010)	−.0015 (.0011)	−.0003 (.0006)
Reduced form:			
Model 3: All controls (state maximum EITC estimate presented)	−.0016 (.0041)	−.0081+ (.0042)	−.0020 (.0022)
Model 4: Add state fixed effects (state maximum EITC estimate presented)	−.0008 (.0041)	−.0081+ (.0042)	−.0021 (.0022)
Model 5: With family fixed effects (state maximum EITC estimate presented)	.0030 (.0048)	−.0015 (.0053)	−.0014 (.0032)
Control function:			
Model 3: All controls (income estimate presented)	−.0012 (.0031)	−.0058+ (.0031)	−.0014 (.0017)
Model 4: Add state fixed effects (income estimate presented)	−.0006 (.0031)	−.0060+ (.0031)	−.0016 (.0017)
Model 5: With family fixed effects (income estimate presented)	.0025 (.0040)	−.0012 (.0044)	−.0012 (.0026)

Note: 4,040 family-wave observations of 1,750 families. Standard errors in parentheses. Standard errors for the LP estimates are clustered by family. Robust standard errors are used for the fixed effects estimates. Model 1 contains no covariates, Model 2 controls for all time constant and time varying covariates, Model 3 adds the average of lagged and current income, Model 4 replaces region fixed-effects with state fixed effects, and Model 5 includes family-specific fixed effects.

+ p<.10

* p<.05

** p<.01

*** p<.001