Work Requirements and Child Tax Benefits: Evidence from California*

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Abstract

Many U.S. safety-net programs condition benefit eligibility on work. Eliminating work requirements would better target benefits to the neediest families but attenuates pro-work incentives. Using administrative records, we study how expanding a California child tax credit to non-workers affected maternal labor supply. We rely on quasi-random birth-timing and a novel method for using placebo analyses to maximize estimator precision. Eliminating the work requirement caused very few mothers to exit the labor force; our 95% confidence interval excludes reductions over one-third of one percent. Our results suggest expanding tax benefits to the lowest-income families need not meaningfully reduce workforce participation. (*JEL* H24, I38, J22)

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1 Introduction

A large and growing body of research documents substantial long-term benefits of transferring resources to children growing up in poverty (National Academies of Sciences, 2019; Aizer, Hoynes and Lleras-Muney, 2022).[1] However, in the United States today, some of the largest social welfare programs focused on children exclude the lowest-income families from their scope. In particular, both the Earned Income Tax Credit (EITC) and Child Tax Credit (CTC) provide no assistance to parents without income and provide only limited assistance to parents with very little income during the year. There have been many proposals to restructure these programs to provide larger benefits to the lowest-income families.[2] However, making such changes risks attenuating the financial incentive to work that these programs create (Besley and Coate, 1992). If parents can access child benefits whether or not they work, how will that affect their decisions about whether to participate in the labor force?

To shed light on this question, we draw upon a unique policy and its subsequent reform. In 2019, California created the Young Child Tax Credit (YCTC), a $1,000 refundable state tax credit per return for low-income parents of children below the age of 6. Initially, like the federal CTC, the YCTC was available only to taxpayers with positive earned income during the year. Then, beginning in 2022, California eliminated the work requirement altogether, allowing any taxpayer who otherwise qualified for the YCTC to claim the full credit amount even if that taxpayer earned no income during the year. As with many policies that expand benefits for very low-income children, this reform reduced the incentive for taxpayers to participate in the labor force. In particular, the reform converted what had previously been a substitution effect with respect to taxpayers' labor force participation (taxpayers could

[1] Some recent examples of this literature include Dahl and Lochner (2012); Aizer et al. (2016); Bastian and Michelmore (2018); Cole (2021); Barr, Eggleston and Smith (2022); Bailey et al. (2023); Bhardwaj (2023); and Rittenhouse (2023).

[2] With respect to the EITC, reform proposals include replacing the EITC with a flat means-tested credit based on family size along with a per-worker income subsidy (Burman, 2019; Drumbl, 2019; National Taxpayer Advocate, 2020). With respect to the CTC, in 2021 Congress considered legislation to permanently make the credit fully refundable, so that low-income taxpayers could receive the full credit amount. Concerns that this reform would lead to parents dropping out of the labor force were central to the bill's opposition.

receive the YCTC only if they worked) into an income effect (taxpayers could receive the YCTC whether or not they worked). We study the effect of these changing incentives on the labor force participation of California mothers with young children.

To do so, we combine administrative tax records with variation in mothers' exposure to the reform induced by quasi-random variation in the timing of their children's births. An important feature of our data is that we are able to measure labor force participation from wage and self-employment income reported in third party information returns; this increases the likelihood that any change in labor supply we observe reflects a real change in behavior rather than simply a change in what taxpayers report.

We focus on mothers who worked in California during the prior year and whose youngest child turned six just before or just after the YCTC's age-eligibility cutoff. To increase the precision of our estimates, we select our empirical specification to minimize the (out-of-sample) estimation error of pseudo-treatment effects during a set of placebo years prior to the adoption of the policy. Using this specification, we estimate the difference in labor force participation between mothers of age-eligible children versus age-ineligible children during the time period in which the YCTC was subject to the work requirement, as well as during the time period in which it was not. Under plausible assumptions, the difference in these differences corresponds to the effect of eliminating the work requirement.

We find that eliminating the YCTC work requirement did not cause a significant number of California mothers to exit the labor force. Our main specification yields a precisely estimated but very small reduction in labor force participation (0.06 percentage points), with a 95% confidence interval ranging from a reduction of 0.35 percentage points to an increase of 0.23 percentage points. These reduced form results correspond to an elasticity of labor force participation with respect to the after-tax return to work of 0.01, or 0.06 when we focus on the lower end of our estimated 95% confidence interval.

We validate our identifying assumptions with several placebo exercises. These replicate our main analysis for mothers in other states or time periods; for mothers whose youngest child turned five (instead of six) around the turn of the outcome year; and for mothers with a younger child who see no difference in their YCTC eligibility when their older child turn six. We find no differences in labor supply among mothers of children on either side of the age cutoff for any of these placebo groups.

We supplement our main analysis with two additional samples: California mothers whose children were enrolled in Medicaid and mothers of all children assigned a social security number in California constructed based on the Social Security Administration's Numident file. These samples complement our main analysis as they include mothers who did not work during the prior year, allowing us to study how the work requirement shapes the flow of nonworking mothers into the labor force. Here too, our estimated 95% confidence interval excludes substantial reductions in labor participation from the elimination of the YCTC work requirement. We also document qualitatively similar results among the lowest-income taxpayers who experienced a somewhat larger change in the return to work from the policy reform.

We conduct several additional analyses to further explore our results. We find no substantial effect of the work requirement on the share of taxpayers reporting very low incomes or when using reported earnings instead of third-party earnings to measure labor force participation. However, we do find positive effects of the reform on tax filing, consistent with increased take-up from simplified eligibility rules.

Finally, we consider the applicability of our results to other policy settings. For example, the YCTC's work requirement could be satisfied by earning any positive amount of income; as such, we would expect it to generate a larger extensive labor supply response compared to similar policies with a more traditional income phase-in structure. We also considered potential differences between the YCTC and other child benefits such as the maximum benefit amount, the timing of the policy's introduction and reform, and the YCTC's administration through the state income tax system. Informed by this analysis, we apply our results to estimate the effect of a reform that would expand the federal CTC to fully cover the children of low-income and non-working parents, along the lines of an expansion that was temporarily enacted for 2021. Our results suggest this policy change would result in fewer than 155,000 parents leaving the labor force, an estimate substantially below what analyses based on prior estimated elasticities would predict (Goldin, Maag and Michelmore, 2022; Corinth et al., 2021; Bastian, Forthcoming), but consistent with recent empirical work that has studied the effects of the temporary 2021 CTC expansion (Ananat et al., 2022; Enriquez, Jones and Tedeschi, 2023; Pac and Berger, 2024). We interpret our results to suggest that the labor market consequences of expanding the generosity of child benefits to very low-income and non-working families may be less than what would have been predicted on the basis of prior research.

Our results contribute to a literature studying the labor supply effects of child tax benefits, both in the United States and in other countries. Papers that study labor participation responses to these policies identify a substitution effect if the policy is conditioned on work, or an income effect if it not.[3] In contrast, policies like the one we study, which transform a benefit that is conditional on work into a benefit that is not conditional on work, layer both income and substitution effects. Closer to our focus, several recent papers study the effect on labor supply of the elimination of the federal CTC's work requirement and phase-in structure as part of the 2021 tax reform (Pac and Berger, 2024; Ananat et al., 2022; Enriquez, Jones and Tedeschi, 2023). We complement these studies—all of which rely on survey data and an event-study design comparing labor supply trends between parents and non-parents—by adding precision through a much larger administrative data set and an alternative identification strategy that takes advantage of a particularly close link between the treated and untreated groups.[4]

[3]Studies of policies that condition benefits on work find mixed results, with some finding positive effects on labor supply (Lippold, 2022; Milligan and Stabile, 2007) and others finding no effect (Mortenson et al., 2018). Among studies focused on policies that do not condition on work, some find negative effects on labor supply (González, 2013; Schirle, 2015; Wingender and LaLumia, 2017; Jensen and Blundell, 2024; Lippold and Luczywek, 2024), others find no effect (Messacar, 2021; Baker, Messacar and Stabile, 2023), and some find positive effects (Feldman, Katuscak and Kawano, 2016).

[4]Outside of the tax context, our paper contributes to a growing literature studying the labor supply effects of work requirements in other safety net programs such as SNAP (Harris, 2021; Han, 2022; Gray

A large related literature investigates the labor supply effects of tax policies that incentivize labor force participation, with particular focus on the EITC.[5] Such policies incentivize work by providing a benefit that is exclusively available to working taxpayers. In contrast, reforms that delink child benefits and work affect the return to work by expanding an existing benefit to non-workers. Although both types of policies shape the return to work, their effects need not be symmetric. For example, the latter category of policies, but not the former, affect the return to work for taxpayers with incomes above the EITC phase-out; in some analyses, a substantial share of the predicted reduction in labor participation from expanded child tax benefits stems from the labor response of this group (Corinth et al., 2021). In addition, taxpayers may be more likely to understand that benefits like the EITC, which are labeled and communicated to taxpayers as earnings subsidies, are conditional on work, whereas the same may not be true for benefits framed as support for children. To the extent that the work requirements embedded in these policies generate different responses, the observed labor supply effects of prior EITC expansions would not apply to reforms that expand the scope of low-income families eligible for child tax credits. We therefore view our results as providing some of the most direct evidence to date on the labor supply effects of conditioning child tax benefits on work.

A final contribution of our paper is methodological. Researchers exploiting quasi-random treatment assignment in regression discontinuity type settings must make a number of modeling choices relating to the empirical specification they employ (Lee and Lemieux, 2010). We propose and implement a data-driven method for making these choices that draws on the availability of a range of placebo samples. Specifically, we select the elements of our empirical specification (e.g., bandwidth, polynomial order) to minimize the mean squared

et al., 2023; Cook and East, 2024), Medicaid (Sommers et al., 2020), and TANF (Falk, 2023).

[5] Much of this literature documents a substantial effect of the EITC's work incentive on labor force participation, with little to no effect on the intensive margin of labor supply (for reviews, see Eissa and Hoynes, 2006; Nichols and Rothstein, 2016; Schanzenbach and Strain, 2021). In general, more recent studies, as well as studies focusing on more recent policy changes, have tended to find smaller elasticities (e.g., Bishop, Heim and Mihaly, 2009; Lin and Tong, 2017; Hoynes and Patel, 2018; Bastian and Jones, 2021), or in the case of Kleven (2023), no labor participation response.

error when the estimator is applied to samples of California mothers in the years prior to the YCTC's adoption. In focusing on mean squared error, our approach shares the objective behind popular existing methods for specification selection in regression discontinuity settings (Imbens and Kalyanaraman, 2012; Calonico, Cattaneo and Titiunik, 2014; Pei et al., 2022). The novel aspect of our procedure is to evaluate the performance of each candidate specification in placebo settings that plausibly approximate the distribution of potential outcomes across the threshold in our actual sample of interest (i.e., the turn-of-the-year for samples of California mothers in years prior to the introduction of the YCTC). Doing so allows us to choose among potential specifications to maximize precision while avoiding concerns of over-fitting.[6] Jointly optimizing over bandwidth and polynomial order – as advocated by Hall and Racine (2015) in a related context – highlights important interactions between the two modeling choices. The specification we end up selecting based on this approach yields substantially more precise results compared to the specification employed in recent papers that exploit similar variation in birth-timing. More generally, our proposed approach can inform the choice of specification in regression discontinuity designs when suitable placebo datasets are available to the researcher.

2 Institutional Background

At the federal level, the US income tax code provides a number of benefits for taxpayers who claim children on their returns. The largest federal tax benefit for children is the Child Tax Credit (CTC), which provides a tax credit of up to $2,000 for each child under the age of 17 that the taxpayer claims on his or her return.[7] The credit is partially refundable,

[6] Ludwig and Miller (2007) and Imbens and Lemieux (2008) also propose bandwidth selection procedures that avoid over-fitting by evaluating performance out-of-sample; an important difference between those procedures and our approach is that we assess the accuracy of the specification using the actual threshold relied on for identification (i.e., the turn-of-the-year), which may yield a different bias or variance than other pseudo-cutoffs. Cattaneo, Idrobo and Titiunik (2019) discuss the inclusion of a regularization term in the bandwidth selection objective, which is another potential route for addressing over-fitting concerns when evaluating MSE in-sample.

[7] The CTC has been reformed a number of times since its introduction in 1997; we focus on the rules in place for recent tax years other than 2021.

with the refundable portion gradually phasing in once the taxpayer's earned income exceeds $2,500. In addition, the total refundable portion is capped at $1,400 per child. Because of these aspects of the credit's design, taxpayers without earned income during the year do not benefit from the CTC, and many working class taxpayers do not qualify for the full maximum benefit (Collyer, Wimer and Harris, 2019; Goldin and Michelmore, 2022). The CTC begins to phase out for taxpayers with annual incomes over $200,000 if single and $400,000 if married.[8]

Turning from federal to state tax policy, a growing number of states provide their own child tax credits in addition to the federal benefit.[9] Our focus is on a policy change in the design of one such benefit: California's Young Child Tax Credit (YCTC). Beginning in 2019, the YCTC provides a maximum state tax credit of up to $1,000 per tax return for California taxpayers who meet its income requirements and who claim one or more children below the age of six.[10] From 2019-2021, an average of 407,000 California taxpayers received approximately $375 million of YCTC annually, with an average benefit amount of $922 per return.[11]

Although both the CTC and YCTC provide benefits to taxpayers with children, the two credits differ in a number of respects. First, the YCTC is only available for taxpayers with young children: taxpayers must claim at least one child under the age of 6 (versus under 17 for the federal CTC). Specifically, the dependent child must not have turned six on or before December 31st of the given tax year. Second, the YCTC targets lower-income

[8] The other main federal income tax credit providing benefits to taxpayers with children is the Earned Income Tax Credit (EITC). The EITC phases in by income, with a maximum benefit in 2019 ranging between $3,526 and $6,557 depending on the number of children a taxpayer claims (a smaller benefit is available to working taxpayers who do not claim children). For most children, the maximum age to qualify a taxpayer for the EITC is 18, or 23 if the child is a full-time student.

[9] As of 2023, 15 states offer a child tax benefit. These policies vary with respect to their maximum benefit (from $100 to $1,750 per child), the age of the dependent child, the income range on which they are focused, and whether taxpayers must work in order to claim them.

[10] This amount was increased to $1,083 and $1,117 for tax year 2022 and 2023, respectively.

[11] Authors' calculations based on California Franchise Tax Board (2019) and subsequent reports. By comparison, the California EITC, which targets families in the same income range, benefited approximately 3.7 million taxpayers per year during the same years, with an average benefit amount of $197 per return, or $463 per return among the one million returns with children.

families by phasing out at a much lower income level than the CTC ($30,000 versus $200,000 or $400,000). Third, the YCTC does not vary based on the number of young children in the household, unlike the CTC which is a per-child benefit. Finally, a key difference between the CTC and YCTC for our purposes is the relationship between credit amount and earned income for low-income taxpayers. Whereas refundability of the CTC phases in by earned income and is capped at $1,400, the YCTC is fully refundable at all income levels – benefits are not phased in. Thus, for California taxpayers who qualify for the YCTC, the YCTC is equivalent to a flat cash transfer (at least until the phase-out threshold is reached).

The aspect of the YCTC on which we focus is eligibility for taxpayers without earned income. From the program's introduction (beginning with tax year 2019) through tax year 2021, taxpayers were required to have positive earned income to qualify for the credit. We refer to this aspect of the credit's design as a work requirement. In the years that the YCTC work requirement was in place, taxpayers without earned income did not qualify for the YCTC whereas taxpayers with one dollar or more of earned income qualified for the full benefit amount, assuming they were otherwise eligible (see Panel A of Figure 1).[12] Then, beginning in tax year 2022, taxpayers were no longer required to have positive earned income to qualify for the YCTC, eliminating the work requirement (see Panel B of Figure 1). We use this policy change to study how conditioning child tax benefits on work shapes labor force participation.

3 Data

We draw on federal administrative tax records for our analysis. This data includes the universe of children who receive a social security number or Individual Taxpayer Identification Number as well as the parents listed on those children's birth certificates.

Our main sample consists of California mothers who worked during the prior year whose

[12] During this policy period, California legislators expanded YCTC eligibility for taxpayers without social security numbers authorizing them to work; below, we consider specifications that exclude this group from our analysis.

youngest child turns six around the start of one of our policy years. We construct this sample as follows. The first three steps each draw on Social Security birth records. First, we identify the cohort of children for a given policy year. This cohort consists of the universe of U.S. children who turned six years old during the final months of the policy year as well as those children who turned six years old during the first months of the year following the policy year. For example, the 2020 cohort consists of children born at the end of 2014 or the start of 2015. Children in the latter category are age-eligible for the YCTC in the policy year whereas children in the former category are not. Second, we link children to the individual listed as the child's mother on the child's birth certificate. Third, we identify other children of the same mother, and drop mothers who have given birth to a child younger than the reference child before the policy year. This restriction excludes mothers who would continue to qualify for the YCTC despite their reference child aging out of eligibility.[13] Fourth, we restrict the sample to the subset of mothers who received a third-party information return (Form W-2, 1099-Misc, or 1099-NEC) showing positive income for the year prior to the policy year.[14] We assign individuals to states based on the taxpayer's residence information listed on this form. Finally, for our main analysis, we restrict this sample to the subset of mothers from California.

By focusing on individuals who were recently in the labor force, our primary sample sheds light on a question that has been central to recent policy debates: the degree to which expanding the refundability of child tax credits causes taxpayers to exit the labor force. A downside of this sample is that it does not allow us to study effects on the flow of non-working individuals into the labor force. However, recall that our main sample relies on prior-year income reports to classify individuals to states; a challenge in constructing samples with non-working mothers is that we lack a comprehensive source of information regarding the

[13]Because this restriction is based on the presence of younger children born *prior* to the policy year, mothers who give birth to a child during the policy year will remain eligible for the credit. We investigate the sensitivity of our results to this issue below.

[14]We do not otherwise limit our main sample based on income because, in principle, even individuals' with incomes above the YCTC cutoff may change their behavior in response to the policy. We present subgroup results for high- and low-income taxpayers below.

state in which the individual resides.

We supplement our analysis with two alternative samples that include non-working mothers; each takes a different approach to the data challenge of accurately assigning mothers to states. First, we construct a sample of California mothers whose children were enrolled in Medicaid or Children's Health Insurance Program (CHIP) during the prior year. Crucially for our purposes, the children in these categories are listed on Form 1095-B, showing their health insurance coverage, which allows us to identify their state of residence even if they did not receive third-party reported income during the prior year. The second alternative sample we consider consists of the universe of children who were born in California. This sample is constructed based on the Social Security Administration's Numident file, which we accessed and linked to tax records through the U.S. Census Bureau.[15] Each of these alternative samples has its own benefits and limitations. The Medicaid sample has good coverage of low-income Californians but may not be representative of the uninsured or individuals who obtain health insurance through other means. In contrast, the Census sample has broader coverage, but lacks the information return data for self-employment income that our primary data set includes.[16]

Our primary outcome is whether an individual works during the policy year. It is constructed based on whether the IRS receives an information return (Form W-2, 1099-Misc, or 1099-NEC) for the individual showing positive income during the policy year. Because this measure is based on third-party filed information returns, it covers individuals who did not themselves file an income tax return. Additionally, this ensures that our estimates measure real changes in labor force participation and not changes in reporting behavior in response to tax incentives (Garin, Jackson and Koustas, 2022). We observe these outcomes from 2000

[15]The Numident file contains dates of birth, county of residence at time of enumeration, and basic demographic information. We link children to parents using the probabilistic matches contained in the Census Household Composition Key; see Aldana (2022) and Bernard, Drotning and Genadek (2024) for details and validation.

[16]In addition, there is a substantial time delay between when most children receive a Social Security Number and their sixth birthday, which could lead to inaccurate assignments for children who move into or out of the state in the intervening years.

through 2023, although some of the data is incomplete in the first few years of this time period and, as of this writing, for 2023.

4 Empirical Framework

Our empirical strategy for estimating the effect of eliminating the YCTC's work requirement is to combine quasi-random variation in birth timing with the policy change in the YCTC's design. Specifically, we compare the labor supply participation of mothers whose youngest child turns six before the end of a given year with mothers whose youngest child turns six after the start of the subsequent year. To estimate the effect of eligibility for the YCTC with a work requirement, we make this comparison for the years following the YCTC's adoption and before the policy change to its design. To estimate the effect of eligibility for the YCTC without a work requirement, we make this comparison for the years following the change in the YCTC's design. We make these comparisons using generalized regression discontinuity specifications of the following form:

$$Y_{it} = \alpha + \beta\, \mathbf{1}_{\{DOB_i \geq 0\}} + g_1(DOB_i) + g_2(DOB_i)\, \mathbf{1}_{\{DOB_i \geq 0\}} + \gamma_t + \varepsilon_{it} \tag{1}$$

where Y_{it} is an indicator for whether mother i had positive earned income in tax year t; DOB_i indicates the date of birth of i's youngest child, centered around the turn of the year with December 31 of year t denoted by 0; γ_t is a set of year fixed effects; and $g_1(\cdot)$ and $g_2(\cdot)$ are polynomials. In this specification, the effect of having a child of an age that qualifies a mother for the YCTC is given by β. The difference in the estimated values of β across policy periods (i.e., for the work requirement years versus the years without a work requirement) forms our estimate for the effect of the YCTC work requirement on labor force participation.

4.1 Empirical Specification Selection

In this subsection, we consider alternative versions of (1) for estimating the effect of the YCTC during a given policy period. We consider three specification choices: (1) the width of the birth-timing window to include in our sample (from 1 month to 24 months surrounding the turn-of-the-year); (2) whether and how to control for differences in the age-eligible and ineligible groups in birth timing (i.e., imposing that $g_1(\cdot)$ and $g_2(\cdot)$ are polynomials of degree 0, 1, or 2); and (3) whether to exclude children born around the end-of-the-year holidays through a "donut" specification (e.g., Barreca et al., 2011). On the one hand, narrower birth-timing windows could reduce bias by estimating our effects from groups that are more similar to one another. Similarly, it could be that bias is reduced by flexibly adjusting for differences in children's birth dates. On the other hand, narrower birth-timing windows and more flexible functional forms could reduce the precision of our estimates by yielding an estimator with larger variance.

We evaluate these trade-offs empirically based on the out-of-sample performance of each specification at estimating the effect of placebo policies in the years before the YCTC was introduced. Specifically, we estimate the effect of the pseudo-policy in each year between 2005 and 2018, using the turn-of-the-year as the assumed threshold for eligibility, and calculate the mean of the squared errors. Because the true "effect" of each pseudo-policy is zero, the squared error for each year corresponds to the square of the estimated coefficient for that year.[17] We then choose among the alternative specifications to minimize the empirical MSE of our treatment effect estimator. Under the assumption that the data generating process for the YCTC potential outcomes during our sample period is well approximated by the data generating process during the 2005-2018 pre-period, this analysis sheds light on the relative precision of alternative estimation strategies for our sample period.

Figure 2 presents the results of this exercise. The blue line plots RMSE for specifications

[17] We begin this analysis in 2005 rather than 2000 due to differences in the availability of W-2 data prior to that year, which could shape the bias-variance trade-off of candidate specifications.

that do not adjust for differences in birth dates between groups – i.e., for simple comparisons of means. For specifications in this category, RMSE follows a "U"-shape pattern with respect to birth-window width, consistent with the presence of a bias-variance trade-off. In particular, RMSE declines monotonically for narrow birth-windows, with larger samples reducing the variance of the estimator from sampling uncertainty. For wider birth-windows, RMSE is monotonically increasing, consistent with increasing bias as the groups of mothers being compared becomes less comparable. The RMSE of the estimator is minimized at a 4-month birth-window. Notably, this width corresponds to the widest birth-window that does not intersect with California's kindergarten cutoff of September 1.

The yellow and purple lines in Figure 2 correspond to common regression discontinuity specifications that respectively adjust for differences in the running variable (date of birth) with a first or second degree polynomial. For specifications that use birth-windows of 8 months or less, the linear polynomial yields higher RMSE than the simple comparison of means, and the quadratic polynomial yields higher RMSE than both. For windows that include a year or more on either side of the cutoff, both the linear and quadratic specifications yield a lower RMSE than the levels comparison. Intuitively, wider windows involve comparing mothers who may differ substantially in their composition, increasing the importance of adjusting for differences in the dates of their children's births. Within the range of window lengths we consider, the RMSE-minimizing windows for the linear and quadratic estimators yield a larger RMSE than the RMSE-minimizing linear estimator.

Finally, we consider the effect on precision of analyzing a donut specification in which we exclude children born around the turn-of-the-year separately for the three specifications in Figure 2. As shown in Appendix Figure A.1, this specification choice appears to increase the variance of estimates for narrow birth-timing windows but does not otherwise appear to have an important effect on the performance of the estimator.

Based on these results, for our primary analysis we focus on the unadjusted difference in means, calculated using a four-month birth-window, and we do not employ a donut specification. This specification differs substantially from the RD specification used in recent empirical papers that employ a similar identification strategy (Barr, Eggleston and Smith, 2022; Rittenhouse, 2023; Bhardwaj, 2023; Lippold and Luczywek, 2024) but according to the results in this section, tends to yield a substantially more precise estimate.[18]

Appendix Table A.1 presents summary statistics for the sample of mothers corresponding to this specification – i.e., mothers whose youngest child turns six in the final four months of the year or the first four months of the subsequent year. The statistics in the table are calculated based on the mothers' tax records from the *prior* year, i.e., the year before their youngest child turns six. The first panel presents characteristics based solely on third-party information returns, while the second panel presents return-level information for the 95% of mothers who filed a return. In the year prior to the policy year, mothers in our sample are on average 35 years old. By construction, all mothers have positive income in the year prior to the policy year with an average (individual) income of approximately $53,000 with 12% receiving some self-employment income. As mentioned above, the vast majority (95%) filed a tax return. Of that group, 55% are married with the average household reporting an adjusted gross income of $113,000, reflecting that more than half of the sample files jointly with their spouse. The average household claims just under two children and roughly one third of those who filed claimed the federal EITC and 90% claimed the federal CTC. Since our data comes from federal administrative tax records, we do not have data on claiming rates for California's state EITC or the YCTC; however, in a sample of low-income families who filed a California return and claimed the federal EITC, the vast majority (92 percent) of those eligible for the state EITC claimed that as well (Iselin, Mackay and Unrath, 2023).

Columns 2 and 3 of Appendix Table A.1 presents prior-year characteristics of mothers whose youngest child falls on either side of the age cutoff, respectively. Comparing mothers

[18] Appendix Figure A.2 compares the distribution of estimated pseudo-effects from our preferred specification (4 month bandwidth, polynomial order 0) and from the regression discontinuity specification employed in these recent papers (4 week bandwidth, donut, polynomial order 1). We observe a similar pattern when comparing the difference in differences estimator based on our preferred specification to the difference in discontinuity estimator based on the above regression discontinuity specification (Appendix Figure A.3).

of children who were age-eligible for the YCTC during the policy year versus those who were not, we observe small differences between the groups. For example, mothers of children born before the end of the year tend to be slightly older, on average, than mothers of children born at the start of the next year.

Finally, to interpret these estimates as the causal effect of eliminating the YCTC work requirement, we impose two identifying assumptions. First, we assume that, but for the difference in policy to which they are exposed, mothers in the age-eligible and age-ineligible groups would have the same average labor force participation during each policy period.[19] This assumption would be violated, for example, if the mothers of children born on either side of the age cutoff differed systematically in their propensity to work for reasons unrelated to the YCTC, such as from compositional differences in the timing of births. Second, we assume that but for the elimination of the work requirement, the effect of the YCTC on labor supply would have been the same in both policy periods. Below, we provide evidence for the plausibility of both of these assumptions in our setting.

5 Results

In this section, we present our main results, using the specification described in Section 4. This specification compares mean labor force participation between mothers whose youngest child turns six during the last four months of an outcome year (age-ineligible group) and mothers whose child turns six during the first four months of the subsequent year (age-eligible group). Our estimate of the effect of eliminating the YCTC work requirement is given by the difference in these differences for outcome years before versus after the change in the YCTC design. As described above, our outcome of interest is maternal labor force participation, which we define as having positive wage or self-employment income reported on a third-party information return for the outcome year.

[19] This assumption is sufficient but not necessary for our difference-in-differences estimator to be unbiased. Our main estimate would also be unbiased if potential outcomes differed across age-eligibility groups, but in a manner that is the same on average across policy periods.

5.1 Main Results

Figure 3 shows labor force participation rates by year among California mothers in the age-eligible and age-ineligible groups. The time period covered by the figure spans three YCTC policy periods: the pre-period years without a YCTC (2005-2018); the years with a YCTC with a work requirement (2019-2021); and two years with a YCTC with no work requirement (2022-2023). In most years, the labor force participation rates of the two groups appear similar to one another.[20]

Table 1 reports our main results. Columns 1 and 2 reports the estimated effect on labor force participation of age-eligibility for the YCTC, before and after the elimination of the work requirement. The reported effect corresponds to the estimate for β in the following regression:

$$Y_{it} = \alpha + \beta \, AgeEligible_i + \gamma_t + \varepsilon_{it} \tag{2}$$

where Y_{it} is an indicator for whether or not mother i had positive earned income in policy year t, $AgeEligible_i = \mathbf{1}_{\{DOB_i \geq 0\}}$ is an indicator equal to one if mother i's youngest child turned six during the first four months of the subsequent year $(t+1)$ and zero if her youngest child turns six during the last four months of policy year t, γ_t is a set of year fixed effects, and ε_{it} is an error term. For each period, Figure 4 plots mothers' mean labor supply by child birth date.

The reported effect in Column 1 is estimated using data from before the elimination of the YCTC work requirement (2019 and 2020); our main analyses exclude 2021 because the temporary expansion of the federal CTC provided additional benefits for taxpayer claiming children under age 6 – the same eligibility cutoff we use for identification here. The estimated effect reflects the labor supply response to the YCTC with a work requirement. We find

[20] Appendix Figure A.4 reports differences in labor force participation between the eligibility groups in each year. In 2017, we observe a small but statistically significant difference across eligibility groups. However, we are not aware of a policy cause for these differences, and a joint test of the yearly differences does not reject the null hypothesis that the eligibility groups had equal labor force participation in each pre-period year.

that mothers of age-eligible children are 0.11 percentage points (11 basis points) less likely to work, with a 95% confidence interval ranging from -0.31 to 0.10 percentage points. Because the YCTC was entirely unavailable to taxpayers without income from work, we can interpret this labor supply response as a pure substitution effect with respect to the extensive-margin of labor supply.

The reported effect in Column 2 is estimated using data from the time period following the elimination of the YCTC's work requirement (2022 and 2023), and represents the effect of an unconditional child benefit for all taxpayers with income below the phase-out range. We find that mothers of age-eligible children are 0.17 percentage points less likely to work (95% CI from -0.38 to 0.04). Because the YCTC was fully available to taxpayers with or without income from work during this time period, we can interpret this labor supply response as a pure income effect with respect to the extensive-margin of labor supply.

Column 3 presents our difference-in-differences estimate of the effect of eliminating the YCTC work requirement on labor force participation. The estimate corresponds to δ in the following specification:

$$Y_{it} = \alpha + \beta\, AgeEligible_i + \delta\, AgeEligible_i * Post_t + \gamma_t + \varepsilon_{it} \tag{3}$$

where *Post* indicates a year following the elimination of the YCTC work requirement.

We estimate that the removal of the YCTC work requirement led to a reduction in mothers' labor force participation of 0.06 percentage points (6 basis points), with a 95% confidence interval ranging from -0.35 to 0.23 percentage points.[21] This estimate represents the cumulative effect of eliminating the extensive-margin substitution effect associated with the pre-reform policy and imposing the extensive-margin income effect associated with the post-reform policy. Hence, the estimated effect in Column 3 provides evidence against the

[21] In principle, to the extent our MSE-optimal specification exhibits non-zero bias, this confidence interval should be re-centered as proposed by Calonico, Cattaneo and Titiunik (2014). In practice, as discussed below, we do not find evidence that our estimator is biased, so that any bias adjustment would be close to zero.

hypothesis that eliminating the YCTC work requirement caused a substantial reduction in mothers' labor force participation.

Appendix Table A.2 reports three robustness checks for our main result. First, some mothers whose children are young enough to qualify for the YCTC will not actually claim those children on their returns; including these individuals in our sample could bias our results toward zero. Panel A limits our sample to the 86 percent of mothers who claimed the child on their prior-year tax return. Second, as noted above, YCTC eligibility for certain non-citizen taxpayers varied during our sample period. To ensure such changes are not conflated with our estimated effect for the work requirement, Panel B limits our sample to the 98% of taxpayers with a valid Social Security Number. Third, Panel C replicates our main analysis including 2021 as an additional year for which the work requirement applied, notwithstanding the existence of the expanded federal CTC for that year. For all three exercises, we obtain results similar to those from our baseline analysis.

To facilitate the consideration of our results in other policy settings, in Appendix B we translate our estimated labor supply effects into an elasticity of labor force participation with respect to the return to work. To do so, we simulate the change in the return to work from the elimination of the YCTC work requirement for the taxpayers in our sample, accounting for pre-tax income, the YCTC, and other taxes and transfers. For our main sample, the elimination of the YCTC work requirement corresponds to a roughly 6 percent reduction in the return to work. Scaling our point estimate by this change in the return to work yields a labor force participation elasticity of 0.01, or 0.06 when we focus on the lower end of our estimated 95% confidence interval. In Section 6, we apply these elasticities to estimate the change in labor force participation from potential reforms to the federal CTC.

5.2 Validity of Identifying Assumptions

We next conduct a range of analyses to investigate the validity of our identifying assumptions.

Our first identifying assumption requires that, but for the policy, labor force participation would be the same on average between the age-eligible and the age-ineligible mothers in each policy period. This assumption would be violated if the mothers of children born on either side of the age cutoff differed systematically in their propensity to work for reasons unrelated to the YCTC, such as from compositional differences in the timing of births. Additionally, this assumption would be violated if other relevant policies differed across the same age cutoff–such as age cutoffs for school entry or eligibility for other young child benefits. Conveniently, and perhaps not coincidentally given our bandwidth selection process, children in California are eligible to attend kindergarten if their fifth birthday falls before September 1 of the given year meaning that all children in our sample become eligible for kindergarten in the same year (the year prior to losing YCTC eligibility). We are unaware of any other policies affecting California mothers that rely on this age cutoff other than the 2021 federal CTC expansion described above.

Table 2 investigates the validity of this assumption. Column 1 estimates Equation (2) for California mothers in the years *prior* to the introduction of the YCTC (2000-2018) – a period for which both age-eligibility groups were exposed to the same (lack of) policy. For this time period, we find no systematic difference between the groups. Columns 2 estimates the difference-in-differences specification (Equation 3) for mothers living in states *other* than California during the same years as our main analysis: 2019-20 and 2022-23.[22] This analysis provides no evidence that labor supply differed systematically between the age-eligible and age-ineligible groups across the two policy periods. Along similar lines, Figure 5 presents the distribution of these pseudo-treatment effects by state and year and presents graphical evidence that the distribution of estimated effects in states other than California is centered at zero.

Columns 3 and 4 present two additional placebo tests for California mothers during our sample period. The first compares mothers whose youngest child turned five (instead of six) during the last four months of the outcome year to mothers whose child turns five during

[22] This analysis excludes the five states (Colorado, Maryland, New Jersey, Oregon, and Vermont) that implemented their own child tax credit with the same age cutoff as the YCTC during 2022 or 2023.

the first four months of the subsequent year. In this case, children on both sides of the cutoff remain age-eligible for the YCTC and so any observed differences in maternal labor supply are not due to differences in eligibility for the credit. The second placebo takes advantage of the fact that the YCTC provides a $1,000 credit per tax return, not per child. As such, mothers of children near the age cutoff who also have a younger sibling see no difference in their YCTC eligibility in the year that the older child turn six. Estimates from the difference-in-differences analyses show no effects of the elimination of the YCTC work requirement on maternal labor supply for either of these two placebo groups.

Our second identifying assumption requires that the average effect of the work requirement on labor force participation be the same in both policy periods. This assumption would be violated, for example, if the labor force environment differed across time periods in ways that could exacerbate or mute the effects of the work requirement. Of particular concern in our setting is that our study period overlaps with the onset of the COVID-19 pandemic in 2020. To assess this concern, Table 3 repeats the main difference-in-differences specification from Table 1 excluding 2020 (Column 1) and excluding 2020-2022 (Column 2), and find that these analyses yield nearly identical results. Along similar lines, we compare the effect of the work requirement across the two years of the policy period for which it was in effect – 2019 versus 2020 – and find no evidence that the effect of the policy varied across these years.

Finally, recall that the unique design of the YCTC work requirement meant that the elimination of that requirement did not generate an income effect for already-working mothers. As such, we can approximate mothers' labor supply when facing a YCTC without a work requirement based on their labor supply when facing no YCTC at all – in neither case does the incentive created by the policy affect the decision of whether to exit the labor force. Thus, under the first identifying assumption, the effect of eliminating the YCTC work requirement exactly corresponds to the (negative of the) coefficient reported in Column 1 of Table 1. Thus, even when our second identifying assumption does not hold, this alternative identification strategy yields a similar estimated effect for our main parameter of interest.

5.3 Treatment Effect Heterogeneity

This subsection explores labor supply effects for sub-populations defined with respect to income and marital status.

Income As described above, the YCTC is fully phased out for taxpayers with incomes over \$30,000. Although the YCTC changes the return to work for all taxpayers—including those above this cutoff—the labor supply incentives may be particularly strong for households with incomes below this cutoff—roughly half of our sample.[23] Columns 1 and 2 of Table 4 repeat our main difference-in-differences specification for mothers with prior-year income below \$30,000 and \$30,000 or more, respectively. We find no evidence that eliminating the YCTC work requirement affected labor participation of low-income mothers. For higher-income mothers, the estimated effect is marginally significant but very small in magnitude, with a similar 95% confidence interval as the overall sample.

Marital Status Another potential source of heterogeneity relates to marital status. During the work requirement period, taxpayers needed to have earned at least \$1 of income *per return* to receive the YCTC; as a result married mothers filing joint returns with a working spouse may have experienced less of a change in labor supply incentives upon the removal of the work requirement than unmarried mothers. At the same time, prior literature suggests large differences in labor supply elasticities of married versus unmarried women, with married women being more elastic. Columns 3 and 4 present our estimates of the effect of the removal of the YCTC work requirement for single and married mothers, respectively, and find no differences in labor force participation.[24]

[23] We explore how the elimination of the YCTC work requirement shapes labor participation incentives by income in Section 6.1.

[24] We measure martial status based on prior-year tax filings; since this information is only available for individuals who filed a return, this analysis is limited to the 95% of our sample who filed a prior-year return.

5.4 Alternative Samples with Non-Working Mothers

Our main sample consists of mothers who, by construction, were already attached to the labor force. As such, our main estimates primarily reflect the effect the YCTC work requirement on labor force exit. However, the work requirement could also shape the degree to which non-working mothers enter the labor force. To study both of these flows, we supplement our main analysis with two alternative samples of California mothers.

5.4.1 Medicaid Sample

The first alternative sample we construct is based on California children enrolled in Medicaid or CHIP. Specifically, this data set consists of the mothers of children who were enrolled in California's Medi-Cal program at some point during the prior year, regardless of whether or not the mother was working (see Section 3 for details). Appendix Table A.3 presents summary statistics for the Medicaid sample. Unlike our main sample of recently working mothers, only two thirds of the mothers in this sample work and receive a substantially lower average income ($16,411 versus $52,612).[25]

Columns 1-3 of Table 6 present results for the Medicaid sample. Column 1 reports the estimated effect of eliminating the work requirements (corresponding to Column 3 of Table 1).[26] Here, our point estimate is slightly positive, though not statistically different from zero (95% CI from -0.38 to 0.83 percentage points). Columns 2 and 3 reports results separately for mothers who worked in the prior year and those who did not. We find no effect on labor supply for either group.

[25] As with our main sample of working mothers, the mothers of age-eligible and age-ineligible in the Medicaid sample have similar characteristics but for a select number of demographics that differ by construction, such as age.

[26] Appendix Table A.4 provides the estimates of the effect of the YCTC with and without a work requirement corresponding to Columns 1 and 2 of Table 1.

5.4.2 Census Sample

Our second alternative sample uses administrative data accessed through the U.S. Census Bureau to identify the universe of children born in California who turned six around the end of one of our outcome years. Construction of this sample relies on the Social Security Administration's Numident file, the Census Household Composition Key, filed tax returns, and third-party wage and salary income information returns (Form W-2).[27] Like the Medicaid sample, the Census sample has the advantage of allowing us to identify children likely residing in California during the relevant policy years without needing to condition on mothers' prior employment and tax filing.

Columns 4-6 of Table 6 presents results for the Census sample. Column 4 reports the estimated effect of eliminating the work requirement for the overall population. The result closely tracks those reported for the other samples: the point estimates is small in magnitude and statistically indistinguishable from zero (95% CI from -0.184 to 0.575). Columns 5 and 6 breaks this estimated effect out separately for birth mothers who worked in the prior year versus those that did not. The estimated effects for these groups share the same signs as the corresponding groups in the Medicaid sample, but here the estimated effect for prior-year non-workers is slightly positive and statistically significant.[28] Overall, we interpret the results in this subsection as evidence that eliminating the work requirement did not substantially reduce labor market entry for prior-year non-workers.

5.5 Effects on Reported Income and Tax Filing

Our primary measure of labor force participation is based on third party information returns, rather than income reported on the taxpayer's return. This measure has the advantage of

[27] In the Census sample, we cannot link parents to information returns other than the W-2s, meaning our employment measure is limited to wage earnings and does not consider self-employment.

[28] Taken at face value, this result suggests that eliminating the work requirement slightly increased the flow of non-workers into the labor force. A positive effect on labor participation could be due to a positive income effect—e.g., from eliminating financial barriers to work. That being said, we acknowledge the possibility that the statistical significance for this subgroup may simply reflect sampling variation.

being available regardless of whether an individual files a tax return; hence, any effect we observe is likely to represent a real change in labor supply rather than change in what a taxpayer reports on her return.[29] At the same time, measuring income solely based on third-party information could lead us to miss changes in labor income that are not reported by third parties – either because no third party is required to report it or because a third party is required to report it but fails to do so.[30] A taxpayer who earns income that does not appear on an information return may be particularly inclined to report it when doing so qualifies her for the YCTC.

Table 5 replicates the analyses in Table 1 using reported income as the outcome, rather than income measured by third party information returns. Specifically, Panels A through C consider the effects of YCTC age-eligibility on whether the mother (along with her spouse, if married and filing a joint return) reported any income from wages, any income from self-employment, or any income from either wages or self-employment.[31] For each outcome, the measure takes a value of zero if the mother did not file a tax return. Across measures, we find no evidence that the removal of the YCTC work requirement led to a reduction in reported income (Column 3). In fact, we estimate a small, though not statistically significant, increase in the share of taxpayers reporting positive earnings from the work requirement's elimination.[32]

Finally, Panel D reports the estimated effect on tax filing. We find that eliminating the

[29] Garin, Jackson and Koustas (2022) find that some taxpayers increase reported self-employment income to maximize tax benefits like the CTC and EITC without actually increasing their labor incomes.

[30] An example of labor income unlikely to show up on third party information returns are the payments a sole proprietor receives from payors below the minimum reporting threshold of $600 per year. A related concern is that the taxpayer may report the income on a state but not federal return. In principle, California taxpayers are not required to file a federal income tax return to claim the YCTC; filing the state return is sufficient. In practice, we expect the vast majority of state filers to also file a federal return reporting consistent amounts of income for the year due to the design of tax preparation software and the modern electronic filing system.

[31] For purposes of this analysis, we measure self-employment income as the sum of income reported on each Schedule C that the taxpayer files.

[32] We also explored changes in the number of taxpayers reporting very low incomes that would nonetheless satisfy the $1 work requirement (Appendix Table A.5). We observe a small effect of the YCTC on such behavior during the time period the work requirement was in place, but can rule out substantial effects on this margin as well.

YCTC work requirement leads to 0.4 percentage point increase in the filing rate. Perhaps surprisingly, this filing effect appears to be only partly driven by an increase in filing among taxpayers without earned income (i.e., those newly eligible for the expanded credit), as suggested by the increase in the share of taxpayers filing and reporting positive earnings (Panel C). It may be that eliminating the work requirement increases tax filing by simplifying the YCTC eligibility rules and thereby increasing the perceived benefit to filing a return (c.f., Anders and Rafkin, Forthcoming).

Overall, we interpret the results in this subsection to suggest that the estimates based on information returns are unlikely to be obscuring reductions in labor income.

5.6 Alternative Specifications

Our analysis in Section 4 suggested that our preferred specification (a simple comparison of means with a four-month bandwidth) yields a more precisely estimated treatment effect than the regression discontinuity specification employed in recent papers that exploit quasi-random variation in birth timing (e.g., Barr, Eggleston and Smith, 2022). As a robustness check, Appendix Table A.6 implements this alternative birth timing RD specification, which consists of a 4-week bandwidth surrounding the turn of the year, excluding an 8-day "donut" encompassing January 1st, and includes a linear trend in child's date of birth. Columns 1 and 2 present the results of this analysis for the YCTC work requirement period and for the period in which the YCTC work requirement was eliminated, respectively. Column 3 presents a difference-in-discontinuities estimate measuring the effect of the elimination of the work requirement on labor force participation.

We find that the elimination of the work requirement led to a reduction in maternal labor force participation of 0.06 percentage points (6 basis points). This estimate is near zero and nearly identical to the estimate in our main analysis in Table 1, but as expected, is measured with substantially less precision: the 95% confidence interval includes a reduction in labor force participation of 2.14 percentage points as well as an increase 2.03 percentage points.

As an additional robustness check, Appendix Table A.7 repeats the analyses in Table 1 using mothers in states other than California as a control group, i.e., a triple-difference specification. As with our main analysis, we find that the removal of the work requirement did not lead to a significant reduction in maternal labor force participation.

6 Implications for Other Policies

We have found that eliminating the YCTC work requirement did not cause substantial numbers of California mothers to exit the labor force. How should this finding inform the consideration of other related policies? The first part of this subsection considers issues that might limit the external validity of our main results. The second applies our findings to estimate the labor supply effects of a potential expansion of the federal CTC.

6.1 Assessing External Validity

In this subsection we explore several factors that could shape how our results inform other policy settings. We consider issues related to the YCTC's design, its benefit amount, and taxpayers' awareness of the credit. As part of our analysis to inform these questions, we study a related reform to Colorado's child tax credit, which we describe below.

Design of the Work Requirement A distinctive feature of the YCTC work requirement was that a taxpayer would qualify for the full credit amount as long as they earned at least $1 during the tax year. A natural question to ask is how the effects of a policy with this design would compare to the effects of a policy where benefits were conditioned on a higher earnings threshold. We formally explore this question in Appendix D. Under mild conditions, we show that the effect of a work requirement on labor force participation is weakly decreasing in the applicable earnings threshold. Intuitively, individuals who are marginal labor force participants with respect to a higher-dollar threshold would also be marginal with respect to a lower-dollar threshold, but not necessarily vice-versa. Consequently, we interpret the effect of the \$1 work requirement we study as an upper bound for the effects of alternative work requirements tied to higher earnings thresholds.

Benefit Amount A different aspect of YCTC that may shape how we extrapolate our results is the size of the benefit amount. The maximum benefit provided by the YCTC (\$1,000 per return) is comparable in size to many other tax-administered child benefits, although there is considerable variation. For example, current state CTCs range from around \$200 per child in Oklahoma and Idaho to \$1,750 per child in Minnesota. The YCTC benefit variation we study is also well within the range of policy variation frequently studied in the literature. For example, Feldman, Katuscak and Kawano (2016) and Lippold (2022) study the effects of a child aging out of federal CTC eligibility during a time period in which this resulted in a maximum benefit change of \$1,000. With respect to the EITC, studies using variation induced by the 1986 Tax Reform (Eissa and Liebman, 1996) or changes in state EITC policy (Michelmore and Pilkauskas, 2021) focus on benefit changes that are smaller than the YCTC variation we study (roughly \$300 to \$700 in 2019 dollars), whereas studies focusing on the EITC's introduction (Bastian, 2020) or 1993 expansion (Meyer and Rosenbaum, 2001) involve larger benefit changes.[33] The YCTC is also roughly twice as generous as California's state EITC (CalEITC): while the maximum CalEITC benefit amount is larger than the YCTC (\$2,650 in 2019 for families with two children), the average CalEITC benefit received among claimants with children is roughly half the size of the YCTC.

In addition, when assessing the magnitude of the YCTC relative to other child tax benefits, the absolute dollar amount of the benefit may not give the whole picture; it may also be important to account for the magnitude of the benefit relative to the income of the potentially qualifying taxpayers. To shed light on this dimension of the YCTC reform we study, Appendix Figure A.5 plots the percentage change in the after-tax return to work

[33]The federal EITC's introduction involved a benefit change of \$1,900 in 2019 dollars. Studies of the Omnibus Budget Reconciliation Act of 1993 typically compare benefit changes of taxpayers with one versus two or more children, corresponding to up to approximately \$1,700 in 2019 dollars.

from the elimination of the YCTC work requirement. Because of the lack of a phase-in, the elimination of the YCTC work requirement led to a very large reduction in the return to work for the lowest-income working mothers, with a smaller (and monotonically declining) reduction for middle- and higher-income mothers. For comparison, the Figure also plots the change in the return to work from two other sources of EITC variation—the initial introduction of the credit in 1975 and its 1993 expansion for families with multiple children—that have been studied in prior research (e.g., Bastian, 2020; Hoynes and Patel, 2018). The figure shows that these reforms generated a smaller percentage change in the return to work for the lowest-income taxpayers—who did not qualify for the full EITC amount—and a larger percentage change for middle- and higher-income taxpayers.

Finally, one reason why the effect of eliminating the YCTC work requirement might not directly extrapolate to other policies, even after scaling, is if taxpayers are less likely to pay attention to or otherwise account for smaller programs when deciding whether to work (Chetty, 2012). To assess this possibility, we supplement our main analysis – focused on California – with a similar analysis focused on the introduction and reform of a young child tax credit in Colorado. Like the YCTC, Colorado's Child Tax Credit was targeted at children under six years old, the same age cutoff as the YCTC. Additionally, the credit initially was unavailable to non-workers in the first two years it was in effect (2021 and 2022), but was expanded to this group for tax years beginning in 2023.[34] The Colorado credit was larger than the YCTC in two respects. First, the maximum benefit for a taxpayer claiming one child was $1,200 in Colorado compared to $1,000 in California. Second, and more importantly, the Colorado credit benefit was on a per-child basis (e.g., taxpayers claiming two children could receive a maximum benefit of $2,400). To the extent that California taxpayers under-reacted to a $1,000 change in tax incentives because the maximum total benefit from the program was relatively limited, we would expect Colorado taxpayers – who face a potentially much

[34] Unlike the YCTC, prior to its reform the Colorado credit phased-in with parental income until the maximum benefit was reached. For details, see Ahmad and Landry (2023). As we have fewer years of data to study this more recent policy and reform, we primarily focus on the YCTC.

larger maximum benefit – to pay more attention to labor supply incentives associated with the credit.

To assess this possibility, Appendix C replicates our main analyses to study the introduction and subsequent expansion of the Colorado Child Tax Credit.[35] We estimate that the removal of the Colorado CTC work requirement led to a statistically insignificant reduction in maternal labor force participation of 0.3 percentage points, with a 95% confidence interval extending from a reduction of 1.04 percentage points to an increase of 0.41 percentage points. Thus, although the Colorado CTC provided larger benefits than the YCTC to many taxpayers, we observe a similarly small labor supply response to the elimination of its work requirement.

Recency of Policy Introduction One factor that may help explain why removing the YCTC work requirement did not lead to a substantial reduction in labor participation is that the YCTC was itself a new policy. Especially in the year immediately following its enactment, taxpayers may not have been aware of the credit and thus failed to consider its work requirement when making their labor participation decisions.

To assess this possibility, we explore differences in the effect of the YCTC's work requirement over time. If the recency of the policy is an important part of the explanation for the small effects we estimate, we would expect to see larger effects over time as a growing number of taxpayers become aware of the policy and begin to incorporate it in their decision-making. Appendix Table A.8 estimates the effect of YCTC eligibility separately for each year in which the work requirement was in effect.[36] Columns 1 through 3 present results of this analysis separately for each year of the YCTC work requirement period. In all three

[35]This analysis differs from our main specification in two regards: (1) our specification selection procedure described in Section 4.1 implies a 5-month rather than 4-month bandwidth (see Appendix Figure C.1); and (2) we do not exclude mothers with younger children, whose Colorado CTC is increasing in the number of young children claimed.

[36]To account for the possibility that taxpayers only learned about the policy in its third year (i.e., 2021), we include 2021 in this analysis. However, because the federal CTC provided different benefits for the age-eligible versus age-ineligible mothers in our sample during 2021, we also include mothers in other states in our sample for this analysis as an additional control group.

years, we estimate a very small effect of age-eligibility on maternal labor force participation. Additionally, we do not observe a gradient in the magnitude of these coefficients across years that would indicate that taxpayers learned about the work incentives associated with the YCTC over time (Column 4).

Administration of the Benefit Another factor that could shape the applicability of our results to other child benefits is that the YCTC is a state tax credit and is administered through the California income tax system. This may affect taxpayers' awareness of the credit or the hassle of claiming it. For example, claiming the YCTC requires filing a California income tax return; if taxpayers are unwilling to incur the financial or non-financial costs of this step, the incentive effects of the credit are likely to be muted relative to child benefits administered through the federal tax system. On the other hand, we would not expect the fact that the benefit is a state tax credit to entirely eliminate its behavior effects; along these lines, prior research has documented individual responses to many other state income tax policies (e.g., Neumark and Wascher, 2011; Michelmore and Pilkauskas, 2021).

To shed light on these issues, we investigate take-up of the YCTC—i.e., the fraction of taxpayers who qualify for the credit that claim it. Although the claiming of a tax credit is not a perfect proxy for awareness—guided tax preparation software may result in taxpayers claiming credits of which they are unaware—taxpayers may learn about a credit through the process of claiming it on their return or through the associated interactions with tax preparers (Chetty and Saez, 2013). Because we lack individual state tax records, we rely for this analysis on aggregated claim data released by the state agency that administers the YCTC (California Franchise Tax Board, 2019). Specifically, we use our data to estimate the number of YCTC claimants and benefit dollars that federal tax filers claiming young children in California would receive, assuming universal take-up. We then compare this estimate to the official statistics reported by the California revenue agency to estimate the actual YCTC take-up rate. Repeating this exercise for 2019-2021 (the years in which aggregated claim data is available), we estimate that 87% of federal filers claiming children also claimed the YCTC (see Appendix Table A.9). We interpret this result to suggest that among working mothers, take-up of the YCTC is not substantially lower than federal tax benefits for children, consistent with prior research documenting high take-up of the California EITC among federal EITC claimants (Iselin, Mackay and Unrath, 2023).[37]

6.2 Extrapolation of Results to Reform of the Federal CTC

In this section, we apply our results to update predictions on the parental labor supply responses to an expansion to the federal CTC along the lines of the reform that was temporarily adopted as part of the American Rescue Plan Act (ARPA) in 2021. In addition to increasing the maximum per-child credit amount, the ARPA reform removed the earnings requirement to claim the federal CTC as well as the phase-in rate to claim the benefit. These reforms essentially turned the credit, at least temporarily, into a near-universal child benefit. One of the primary stated concerns with making this reform permanent was that it would lead to large numbers of working parents dropping out of the labor force.

Similar to the 2022 reform to the California YCTC, the ARPA reform reduced the economic return to work for a subset of households with earnings that would have placed them on the phase-in portion of the CTC benefit schedule prior to the 2021 reform. This is because, prior to the ARPA reform, the phase-in structure of the credit provided an incentive for households to increase their earnings to receive a larger CTC benefit. With the removal of the earnings requirement and the phase-in, this work incentive was eliminated.

The change in the return to work is more complicated to calculate for the federal CTC than for the California YCTC, since the federal CTC phases-in for earnings above $2,500. This means that the change in the return to work differs depending on household income. We can calculate the change in the return to work (RTW) for a taxpayer with income I associated with the 2021 ARPA reform as follows:

[37] This exercise assumes that all YCTC claimants file a federal return; we view this assumption as plausible given the logistics of the tax filing system.

$$\Delta\ RTW(I) = [CTC_{2021}(I) - CTC_{2021}(0)] - [CTC_{2020}(I) - CTC_{2020}(0)] \quad (4)$$

The first term represents the difference in CTC benefits for a household with earnings I and the CTC benefit available in 2021 for a household with no earnings. In 2021, this term simplifies to zero for the individuals in our population, because the CTC available for households with zero earnings was the same as that available for those with positive earnings.

The second term represents the return to work due to the CTC prior to the 2021 reform. Because households were ineligible for the CTC in 2020 if they had no earnings, the reduction in the return to work can simply be expressed as the value of the CTC benefit in 2020 for a given level of income.

Previous predictions on the number of parents who would stop working because of the reduction in the return to work associated with the ARPA reform ranged from around 350,000 parents (Goldin, Maag and Michelmore 2022; Bastian Forthcoming) to 1.5 million parents (Corinth et al., 2021). The main reason for the discrepancies in these estimates was due to different assumptions about how responsive parents' labor supply would be to changes in the economic return to work, particularly among low-income single mothers.

Using the labor supply elasticities calculated based on our 95% confidence interval lower bound estimates for labor supply responses to the removal of the earnings requirement for the California YCTC, we update predictions from prior work on the expected change in the number of working parents associated with the 2021 reforms to the federal CTC. For this exercise, we use the estimates on the number of working parents from Bastian (Forthcoming), but update the predicted labor supply reduction calculated in that paper for the employment reduction calculated using the elasticities from our analysis of the YCTC reform.

Results of this exercise are presented in Table 7. We estimate that the change in the return to work due to the ARPA reforms range from 5-10%, depending on the sub-sample. Bastian (Forthcoming) estimates that this change in the return to work would lead 367,500 parents to stop working. In contrast, applying labor supply elasticities corresponding to the lower end of our estimated 95% confidence interval, we predict that making permanent the ARPA reform would cause only 155,318 parents to stop working.

7 Conclusion

We study the labor supply consequences of conditioning child tax benefits on work. Our empirical design identifies this effect for mothers of young children—a group for whom the long-term benefits of safety net program eligibility is likely to be particularly large. A central issue in designing child benefit programs is whether to limit eligibility to taxpayers with labor income. Our results suggest that doing so is unlikely to be an effective means of increasing labor force participation in the policy setting we consider.

An important caveat to extrapolating our results to other policy settings is that the design of the YCTC differs from other child benefits in important ways. We explored a number of these differences and did not find evidence that similar reforms to other child benefits would lead to substantially different results. In particular, we independently analyzed the elimination of the work requirement governing Colorado's CTC and estimated similarly small effects on maternal labor supply in that setting as well.

Our results inform estimates of the labor supply response to changes in the work requirements currently governing federal and state tax benefits for children. For purposes of predicting the effect of expanding the federal CTC, our results may provide a better guide than policies that vary statutory tax rates or the maximum EITC amount — although those policies affect the return-to-work, they do not involve the expansion of child tax benefits to non-workers. Similarly, our results provide new evidence for states considering reforms to their own child tax benefits. Fifteen states currently offer a child tax credit, including six states that have adopted a tax benefit for parents of young children since 2022 alone. Thus, in both federal and state contexts, our results suggest that expanding child tax benefits to non-working taxpayers is likely to lead to fewer exits from the labor force than prior micro-simulations would suggest.

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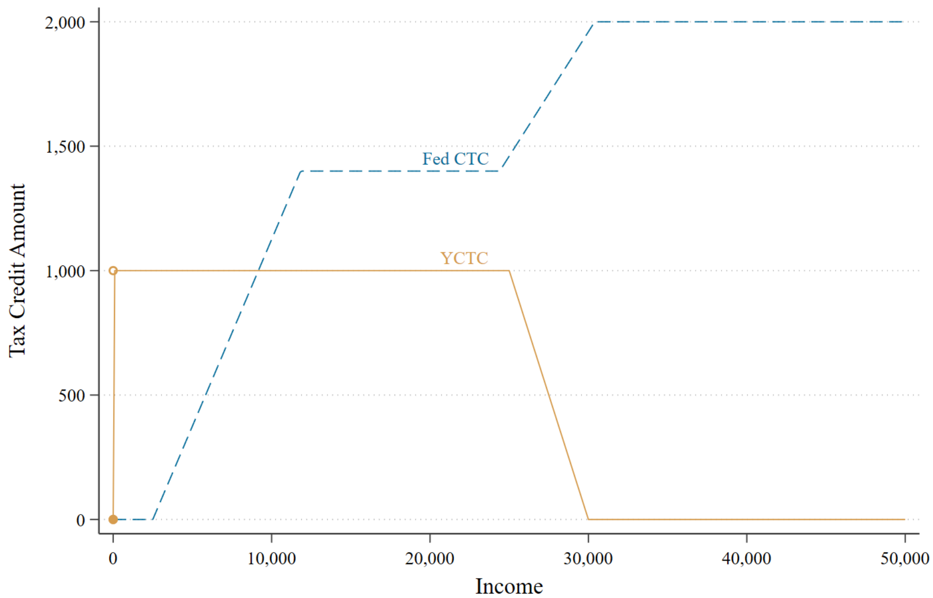
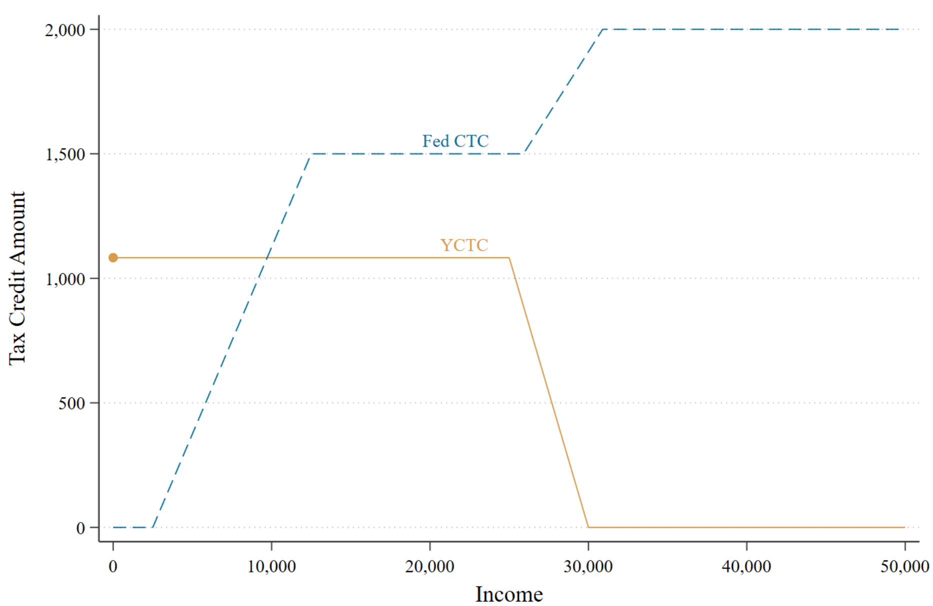
Figure 1: Child Tax Credit and Young Child Tax Credit Benefit Schedule

(a) 2019-2020

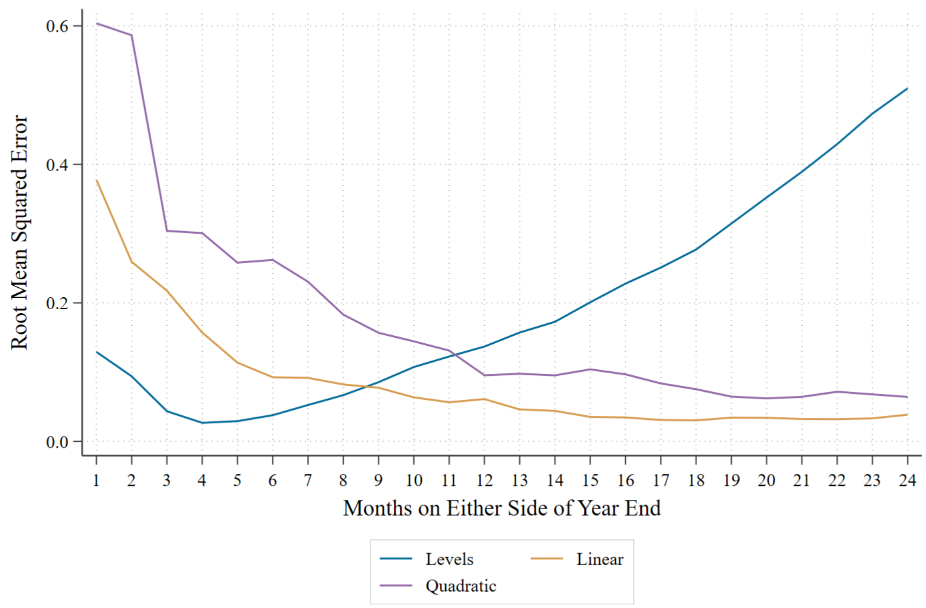


(b) 2022-2023



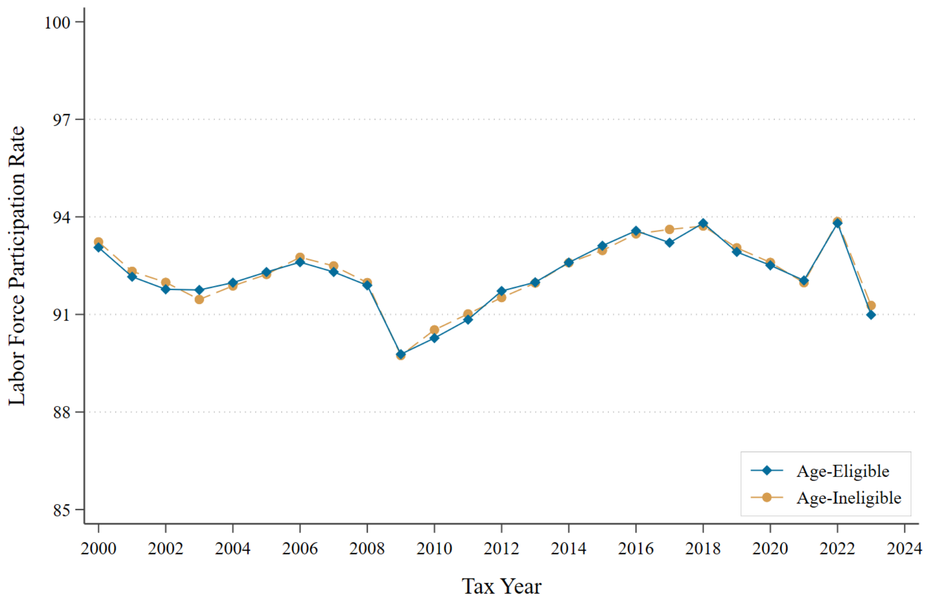
Notes: The figure shows the benefit amount for which taxpayers of varying income levels would qualify, for the California Young Child Tax Credit (yellow) and federal Child Tax Credit (blue). Panel A shows the benefit schedule that applied for tax years 2019 and 2020 (assuming the maximum benefit amount for 2019). Panel B shows the benefit schedule that applied in tax years 2022 and 2023 (assuming the maximum benefit amount for 2022). Each calculation assumes a taxpayer filing a joint return, claiming a single qualifying child under the age of six, and reporting only earned income.

Figure 2: Root Mean Squared Error by Specification and Bandwidth



Notes: The figure reports the results of the exercise described in Section 4.1, comparing the root mean squared error (RMSE) of the distribution of estimated (placebo) effects for different empirical specifications. Each placebo effect is obtained from estimating the effect of age-eligibility for the YCTC following equation (1), for each year from 2005 through 2018. Each estimate is obtained from a sample composed of California mothers whose youngest child turns six within the specified number of months on either side of the end of the specified year. The reported RMSE corresponds to the square root of the average (across years) of the square of the estimated coefficients from each year. The three lines correspond to estimating equations that vary in the date of birth polynomial included in the implementation of equation (1). The purple line includes a quadratic polynomial in date of birth; the yellow line includes a linear trend in date of birth; and the blue line consists of a simple comparison of means of the age-eligible and age-ineligible groups of mothers.

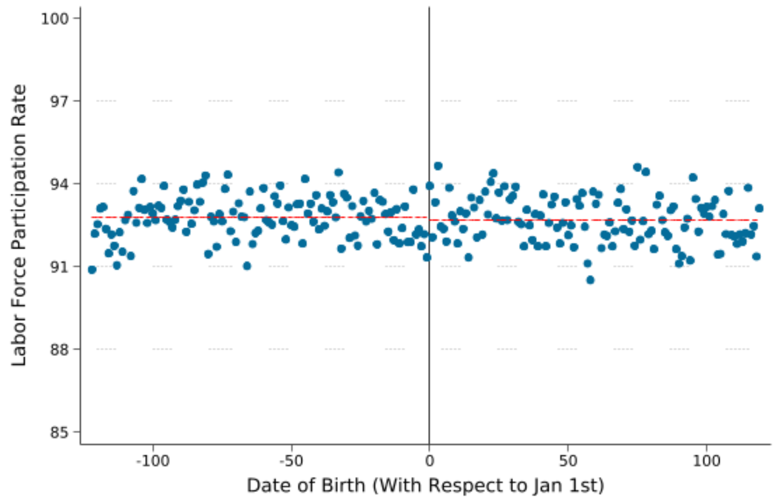
Figure 3: Maternal Labor Force Participation by YCTC Age-Eligibility and Year



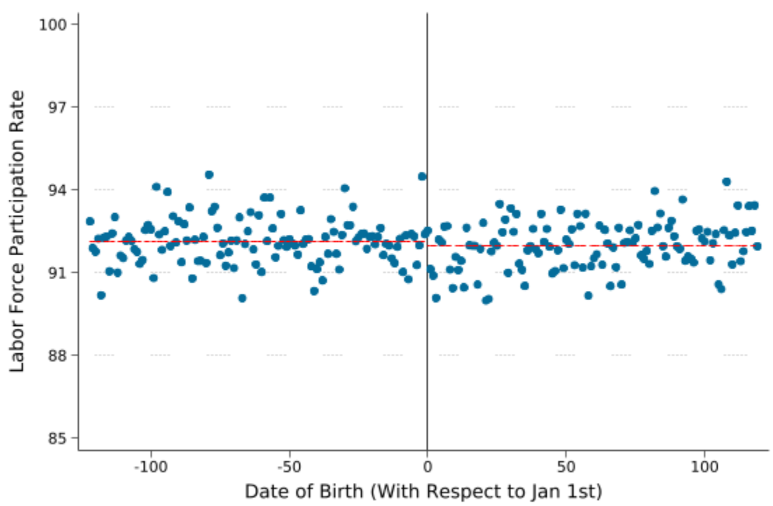
Notes: The figure reports labor force participation rates by year for our main sample. The sample consists of California mothers who had positive positive wage or self-employment income reported on third-party information returns during the previous tax year and whose youngest child's sixth birthday falls within the four-month window around the turn of the specified year. Mothers whose youngest child turns six during the last four months of a year (age-ineligible group) are reported in yellow; mothers whose youngest child turns six during the first four months of the subsequent year (age-eligible group) are reported in blue. Labor force participation is defined as having positive wage or self-employment income reported on third-party information returns.

Figure 4: YCTC Eligibility and Labor Supply by Child's Date of Birth

(a) 2019-2020

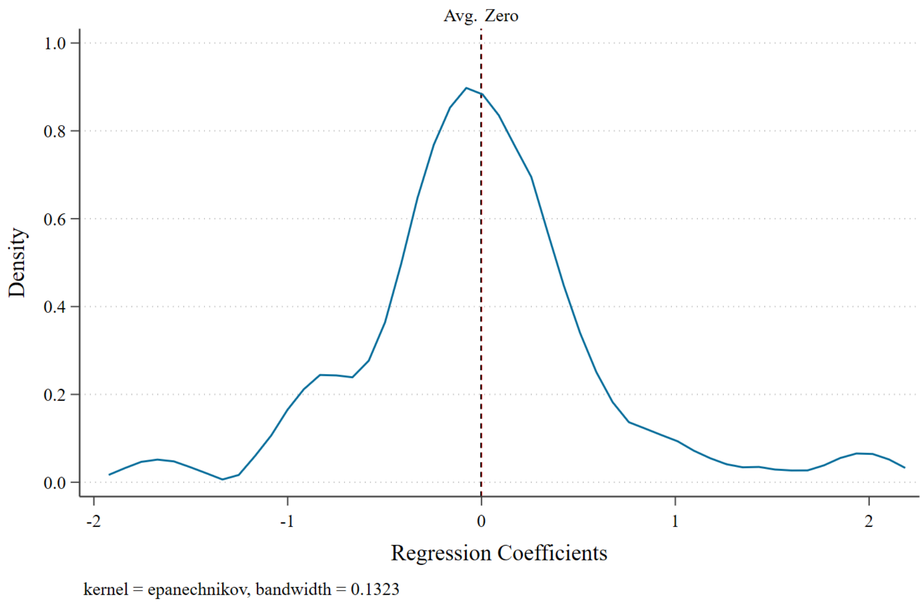


(b) 2022-2023



Notes: The figure reports mean labor force participation rates by child's date of birth for our main sample. The sample consists of California mothers who had positive wage or self-employment income reported on third-party information returns during the previous tax year and whose youngest child's sixth birthday falls within the four-month window around the turn of the year (2019 or 2020 in Panel A; 2022 or 2023 in Panel B). Mothers whose youngest child turns six during the last four months of a year (age-ineligible group) are assigned a negative value for date of birth; mothers whose youngest child turns six during the first four months of the subsequent year (age-eligible group) are assigned a positive value for date of birth. For example, a child born on January 10 would have a date of birth value of 9. Labor force participation is defined as having positive wage or self-employment income reported on third-party information returns. The horizontal lines correspond to the estimated means for the age-eligible and age-ineligible groups.

Figure 5: Distribution of Pseudo-Treatment Effects from Other States



Notes: The figure reports the distribution of regression coefficients obtained from comparing labor force participation (placebo) effects for mothers in states other than California. For each state and year, a coefficient is obtained by comparing labor force participation in the given year among mothers who worked in the given state in the year prior to the given year, and whose youngest child's sixth birthday falls within the four-month window around the turn of the given year. The analysis includes coefficients from 2019, 2020, 2022, and 2023, and from all states and the District of Columbia other than California, Colorado, Maryland, New Jersey, Oregon, and Vermont. The figure plots a kernel-density figure with an epanechnikov kernel and bandwith of 0.1323. The dashed vertical lines denote the sample mean of the distribution (black) and zero (red), as labeled in the figure.

Table 1: YCTC Eligibility and Maternal Labor Supply

	(1)	(2)	(3)
	Work Req. (2019-2020)	No Work Req. (2022-2023)	Diff-in-Diff [(2) - (1)]
Coefficient	-0.107	-0.168	-0.061
	(0.103)	(0.107)	(0.148)
95% CI	[-0.309,0.096]	[-0.377,0.041]	[-0.352,0.230]
Control Mean	92.822	92.564	92.694
Observations	251,645	244,759	496,404

Notes: The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Columns 1 and 2 compare labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Column 1 is estimated for years in which the YCTC contained a work requirement; Column 2 is estimated for years in which it did not. Column 3 corresponds to the difference in estimated effects between Columns 1 and 2. The sample consists of recently working mothers in California whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table 2: Placebo Tests: YCTC Eligibility and Labor Supply

	(1) CA Pre-Period (2000-2018)	(2) National Sample (Diff-in-Diff)	(3) Age 4/5 Cohort (Diff-in-Diff)	(4) Younger Sibling Cohort (Diff-in-Diff)
Coefficient	-0.036	0.006	0.055	0.102
	(0.037)	(0.052)	(0.148)	(0.231)
95% CI	[-0.109,0.036]	[-0.096,0.108]	[-0.234,0.344]	[-0.351,0.556]
Control Mean	92.217	93.658	92.227	89.686
Observations	2,097,327	3,485,515	533,333	277,169

Notes: This table compares labor force participation between various (placebo) groups of mothers who do not differ in their eligibility for the YCTC. The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Column 1 compares mothers of age-eligible versus age-ineligible children in California in the years before the implementation of the YCTC. Columns 2 to 4 present difference-in-differences estimates from equation 3 for three different placebo populations: mothers outside of California, excluding Colorado, Maryland, New Jersey, Oregon, and Vermont (Column 2); mothers of children whose youngest child's *fifth* birthday falls within the four-month window around the turn of the specified year (Column 3); and mothers of children near the age cutoff who also have a younger sibling (Column 4). The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table 3: Investigating Time Variation in Effect of YCTC Work Requirement

	(1) 2022-23 vs 2019	(2) 2023 vs 2019	(3) 2020 vs 2019
Coefficient	-0.043	-0.161	0.037
	(0.179)	(0.217)	(0.207)
95% CI	[-0.394,0.309]	[-0.586,0.265]	[-0.368,0.442]
Control Mean	92.727	92.165	92.822
Observations	369,945	247,932	251,645

Notes: This table compares labor force participation of mothers with children born around the turn of the year for different policy years. The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Column 1 reports the difference-in-differences estimate from equation 3 excluding 2020. Column 2 reports these results excluding 2020 and 2022. Column 3 compares mothers of age-eligible versus age-ineligible children in California in across the two years within the YCTC work requirement period. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table 4: Heterogeneity Analyses: YCTC Eligibility and Labor Supply

	(1)	(2)	(3)	(4)
	Low Income	High Income	Single	Married
Coefficient	-0.062	-0.162*	-0.132	-0.057
	(0.303)	(0.095)	(0.203)	(0.204)
95% CI	[-0.657,0.532]	[-0.348,0.025]	[-0.530,0.267]	[-0.456,0.342]
Control Mean	85.589	98.383	94.275	92.746
Observations	220,331	276,073	212,493	260,481

Notes: This table reports difference-in-differences estimates from equation 3 for different subgroups. The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Column 1 and Column 2 limit to mothers with prior year earnings below or above $30,000, respectively. Columns 3 and 4 limit the analysis to single and married mothers, respectively. include individuals who file taxes as married filing jointly or married filing separately, with or without a spousal exemption. includes mothers with any other tax filing status. These classifications are based on third-party information returns (Columns 1 and 2) and tax filing status (Columns 3 and 4) from the previous year; as a result, Columns 3 and 4 include only the 95% of mothers who filed a prior-year return. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: YCTC and Reporting Outcome

	(1)	(2)	(3)
	Work Req. (2019-2020)	No Work Req. (2022)	Diff-in-Diff [(2) - (1)]
Panel A: Reported Wages			
Coefficient	0.054	0.366**	0.312
	(0.108)	(0.185)	(0.214)
95% CI	[-0.158,0.266]	[0.004,0.728]	[-0.107,0.732]
Control Mean	91.967	88.025	90.669
Observations	251,645	122,013	373,658
Panel B: Reported Schedule C Income			
Coefficient	0.086	-0.027	-0.113
	(0.139)	(0.201)	(0.244)
95% CI	[-0.185,0.358]	[-0.422,0.368]	[-0.592,0.366]
Control Mean	13.995	14.462	14.148
Observations	251,645	122,013	373,658
Panel C: Reported Earned Income			
Coefficient	-0.032	0.255	0.287
	(0.090)	(0.163)	(0.187)
95% CI	[-0.210,0.145]	[-0.065,0.576]	[-0.079,0.654]
Control Mean	94.579	90.925	93.376
Observations	251,645	122,013	373,658
Panel D: Filed			
Coefficient	-0.037	0.359**	0.396**
	(0.074)	(0.160)	(0.176)
95% CI	[-0.183,0.109]	[0.046,0.672]	[0.051,0.741]
Control Mean	96.404	91.340	94.736
Observations	251,645	122,013	373,658

Notes: The outcomes considered in each panel are: an indicator for reporting positive wage income (Panel A), an indicator for reporting positive self-employment income (Panel B), an indicator for reporting positive earned income, wage or self-employment (Panel C), an indicator for filing a tax return (Panel D). Outcomes in Panels A-C take on a value of zero if the individual did not file a tax return. Units are percentage points (0-100). Columns 1 and 2 compare labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Column 1 is estimated for years in which the YCTC contained a work requirement; Column 2 is estimated for years in which it did not and for which income reporting data is available. Column 3 corresponds to the difference in estimated effects between Columns 1 and 2. The sample consists of recently working mothers in California whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. The control mean corresponds to mothers of age ineligible children. Parentheses report heteroskedasticity-robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: YCTC Eligibility and Labor Force Participation: Medicaid and Census Samples

	Medicaid Sample			Census Sample		
	(1) Full Sample	(2) Worked in Prior Year	(3) Did Not Work in Prior Year	(4) Full Sample	(5) Worked in Prior Year	(6) Did Not Work in Prior Year
Coefficient	0.226	-0.064	0.238	0.196	-0.008	0.630**
	(0.308)	(0.240)	(0.455)	(0.194)	(0.130)	(0.288)
95% CI	[-0.378,0.830]	[-0.535,0.406]	[-0.653,1.130]	[-0.184,0.575]	[-0.264,0.248]	[0.064,1.195]
Control Mean	66.722	90.107	19.470	69.4	92.8	17.8
Observations	374,039	250,335	123,704	920,000	630,000	290,000

Notes: This table reports the difference-in-differences estimates from equation 3 for the Medicaid and Census samples. The Medicaid sample includes mothers of children enrolled in Medicaid in the state of California at any point during the prior year. The Census sample is comprised of birth mothers of children born in California; birth parents are identified from the Census Household Composition Key (CHCK) and birth location is according to the Social Security Administration (SSA) Numident file. For the Medicaid sample, the outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns. For the Census sample, the outcome is an indicator for positive wage income reported on a W-2 form; all counts and estimates are rounded per Census's disclosure rules governing administrative records. Results are provided for the full sample (Columns 1 and 4), as well as separately for mothers who had positive earnings income in the prior year (Columns 2 and 5) and for those who did not (Columns 3 and 6). Units are percentage points (0-100). The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The Census Bureau has reviewed results from the Census sample to ensure ensure appropriate access, use, and disclosure avoidance protection of the confidential source data used to produce this product (Data Management System (DMS) Number: P-7503840, Disclosure Review Board (DRB) approval number: CBDRB-FY24-SEHSD003-066.)

Table 7: Modeled Labor Force Exits from the 2021 CTC Expansion

	Bastian (2023) Estimates				Our Estimates	
	(1)	(2)	(3)	(4)	(5)	(6)
	Population	Change in RTW	Elasticity	Labor Force Exit	Elasticity	Labor Force Exit
Married Mothers	5,654,115	0.04	0.20	48,524	0.08	18,584
Single						
Single Mothers & Did Not Claim EITC	1,784,789	0.05	0.20	17,860	0.14	12,260
Single Mothers & Claimed EITC	6,760,784	0.10	0.40	263,213	0.13	86,552
Married Fathers	8,469,542	0.07	0.05	27,610	.	27,610
Single Fathers & Others	2,873,704	0.07	0.05	10,312	.	10,312
Total	25,542,934			367,518		155,318

Notes: This table reports predicted labor market exits among parents associated with the 2021 reforms to the federal CTC. Columns (1)-(4) come from Bastian (Forthcoming); elasticities in column (5) come from the lower end of our estimated 95% confidence interval, reported in Table B.1. For groups for which we do not calculate an elasticity, we apply the corresponding elasticity from Bastian (Forthcoming). refers to the return-to-work due to the CTC, as described in the text of Section 6. The labor force reduction reported in column (6) is obtained by multiplying the population in (1) by the change in return to work in (2) by the elasticities we calculate from our analysis in (5).

Online Appendix to Child Allowances and Labor Supply: Evidence from the California Young Child Tax Credit

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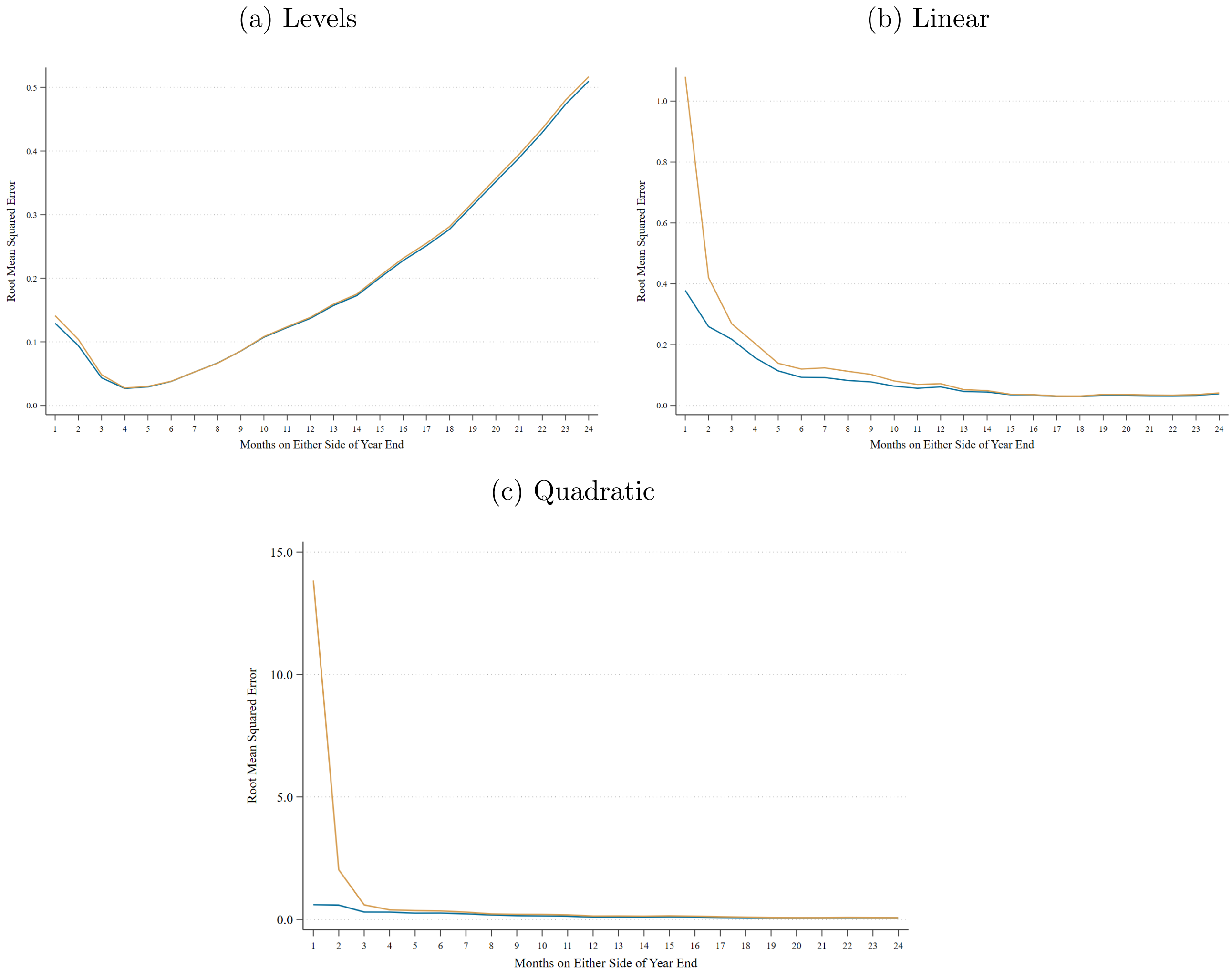
A Appendix Tables and Figures

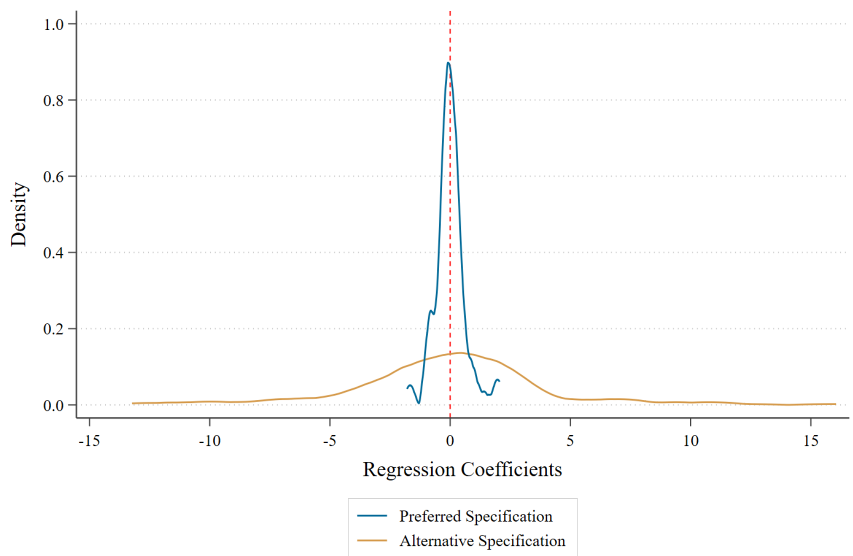
Figure A.1: RMSE by Donut Specification and Bandwidth



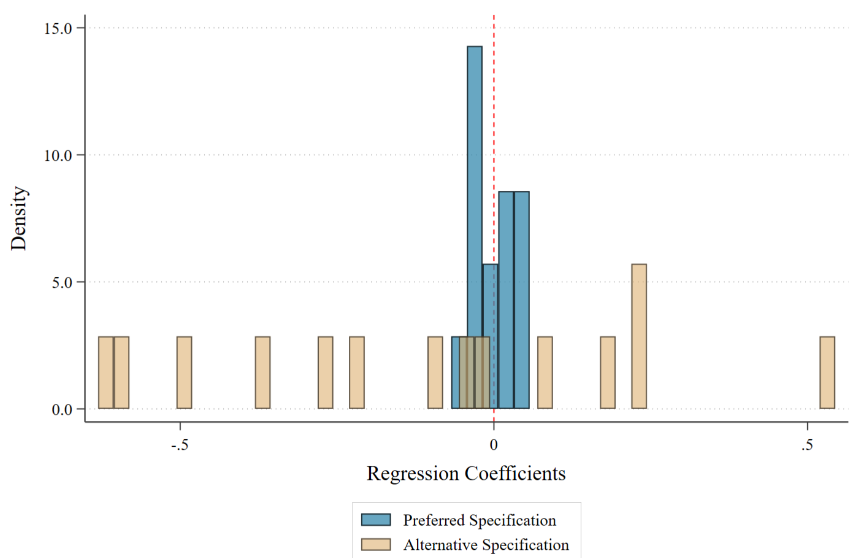
Notes: The figure repeats the analyses in Figure 2 (blue) as well as a corresponding analysis that excludes an 8-day donut around the turn of the year (yellow). The three panels correspond to estimating equations that vary in the date of birth polynomial included in the implementation of equation (1). Panel A is a simple comparison of means of the age-eligible and age-ineligible groups of mothers; Panel B includes a linear trend in date of birth; Panel C includes a quadratic polynomial in date of birth.

Figure A.2: Distribution of Pseudo-Treatment Effects: Preferred versus Alternative Specification

(a) Other States, 2019-20 and 2022-23

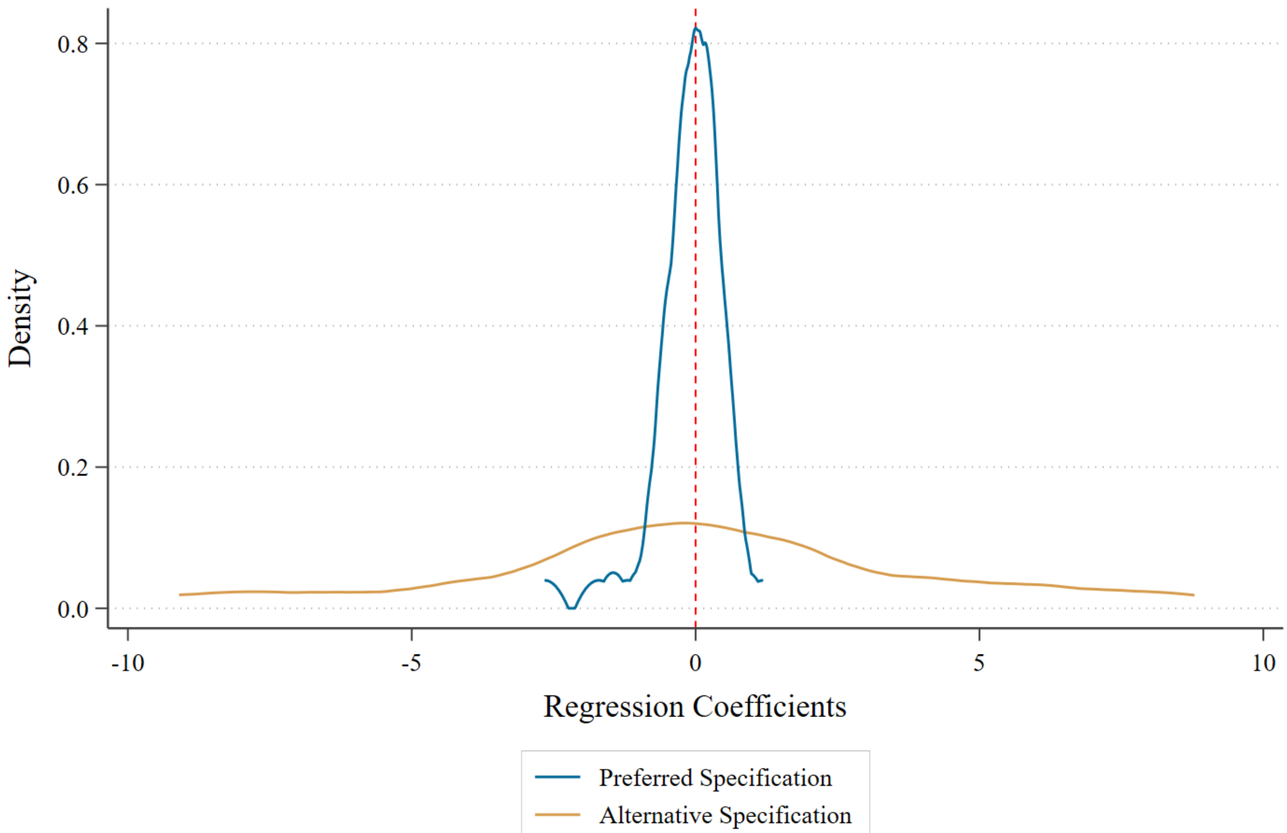


(b) California, 2000-2018



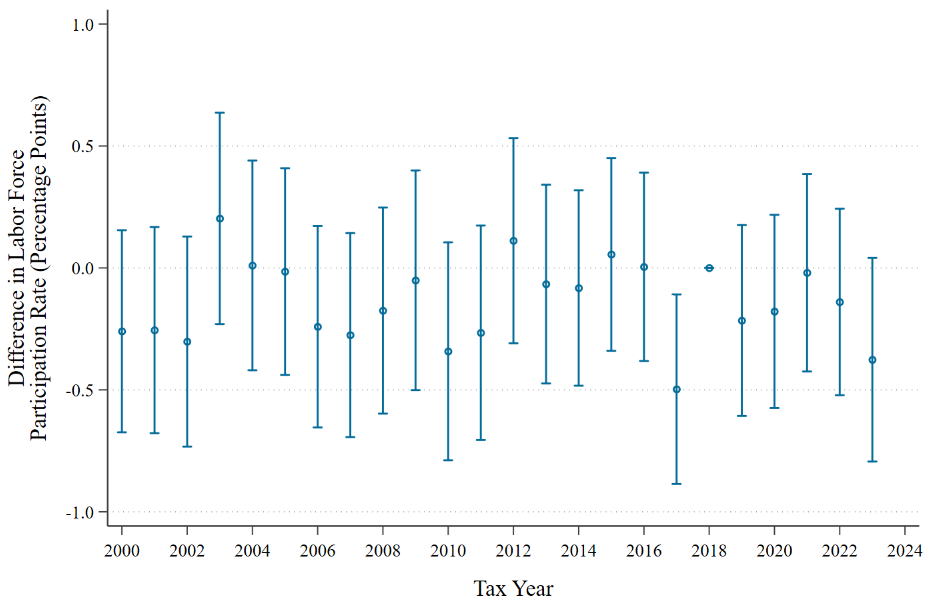
Notes: The figure compares the distributions of (placebo) regression coefficients obtained from our preferred specification, a four-month bandwidth with polynomial order zero (blue) and those obtained from a common alternative regression discontinuity specification with 4-week bandwidth (excluding an 8-day donut around the turn of the year) with a first order polynomial (yellow). Panel A reports the distribution of estimates obtained from other states for years 2019, 2020, 2021, and 2022. Both specifications are separately estimated for each state other than California, excluding states that adopted a child tax policy with an overlapping age cutoff during this sample period (Colorado, Maryland, New Jersey, Oregon, and Vermont). Panel B reports the distribution of estimates obtained from California for years 2000 through 2018.

Figure A.3: Distribution of Pseudo-Treatment Effects: Preferred versus Alternative Differences-in-Discontinuity Design



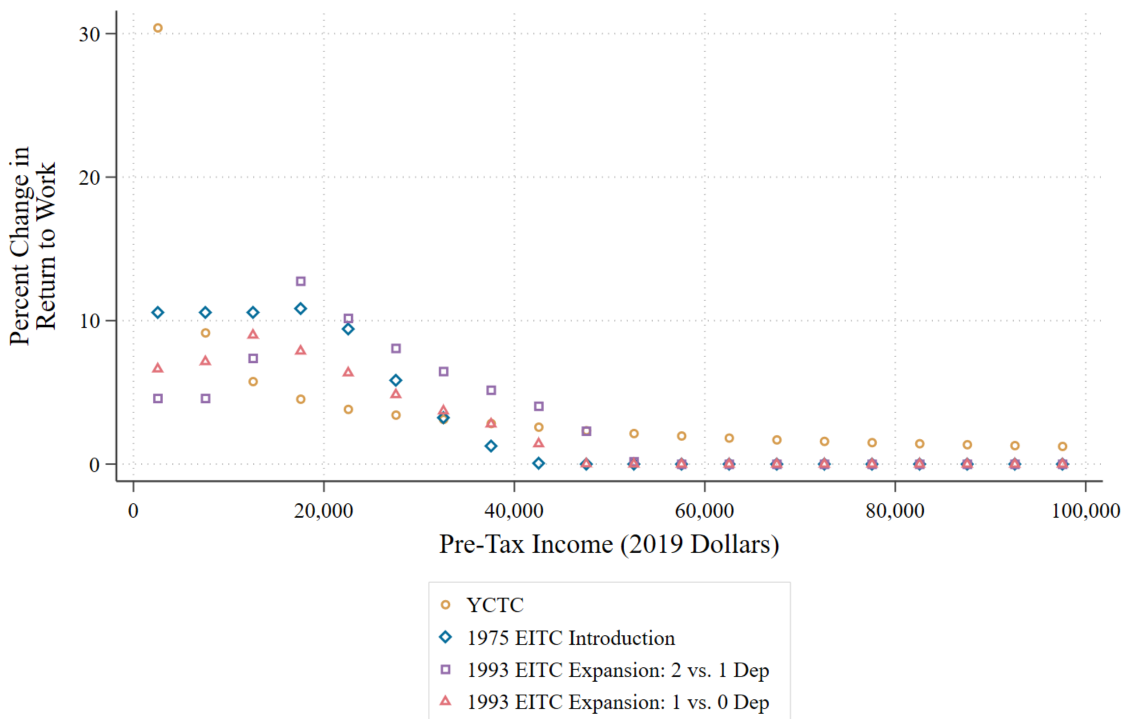
Notes: The figure compares the distributions of (placebo) regression coefficients obtained from difference-in-differences specification comparing age-eligible versus age-ineligible mothers during the period with no YCTC work requirement (2022-2023) and the YCTC work requirement period (2019-2020). The blue line estimates the first difference using our preferred specification, a four-month bandwidth with polynomial order zero. The yellow line estimates the first difference using a common alternative regression discontinuity specification with 4-week bandwidth (excluding an 8-day donut around the turn of the year) with a first order polynomial. Both specifications are separately estimated for each state other than California, excluding states that adopted a child tax policy with an overlapping age cutoff during this sample period (Colorado, Maryland, New Jersey, Oregon, and Vermont).

Figure A.4: Difference in Maternal Labor Force Participation by YCTC Age-Eligibility and Year



Notes: The figure reports yearly differences in labor force participation rates between age-eligible and age-ineligible mothers in our main sample. The sample consists of California mothers who had positive wage or self-employment income reported on third-party information returns during the previous tax year and whose youngest child's sixth birthday falls within the four-month window around the turn of the specified year. The age-ineligible group consists of mothers whose youngest child turns six during the last four months of a year; the age-eligible group consists of mothers whose youngest child turns six during the first four months of the subsequent year. Labor force participation is defined as having positive wage or self-employment income reported on third-party information returns. Coefficient estimates are reported in percentage points (0-100). Bars represent the estimated 95% confidence intervals.

Figure A.5: Percent Change in Return to Work



Notes: The figure plots the percentage change in the return to work for a range of policy reforms. For each reform, the percentage change in the return to work is calculated as the difference between the post-reform return to work minus the pre-reform return to work, divided by the pre-reform return to work. The return to work at a given level of pre-tax income is defined as the after-tax income at the specified pre-tax income minus the after-tax income for which the taxpayer would be eligible if the taxpayer were not to work. After-tax income is calculated net of federal income taxes and payroll taxes, using the NBER TAXSIM model. The plotted points are derived from the calculated percentage change in the return to work at \$100 intervals, averaged into \$5,000 bins. Pre-tax income is based on 2019 dollars; earlier policy changes are inflation-adjusted to 2019 dollars for comparability. Unless otherwise specified, tax liability is calculated assuming an unmarried taxpayer with one child. The figure considers three policy reforms: the elimination of the YCTC work requirement, the introduction of the EITC in 1975, and the expansion of EITC generosity from the Omnibus Budget Reconciliation Act of 1993 (OBRA93). For OBRA93, we separately plot the change in the return to work for taxpayers with one child versus no children, and for taxpayers with two children versus one. For each reform, the pre-reform return to work is calculated based on the tax law in place for the tax year prior to the reform; we assume that the only change in policy is the specified reform, so we do not account for other contemporaneous changes in policies such as changes in statutory tax rates in the year that the reform first applies.

Table A.1: Summary Statistics by YCTC Age-Eligibility

	(1)	(2)	(3)	(4)
	All	Age-Eligible (Jan-Apr)	Age-Ineligible (Sep-Dec)	p-value
Individual-Level				
Age	35.201	35.057	35.337	0.000
Any Income	1.000	1.000	1.000	.
Total Income	52,728	53,103	52,374	0.000
Self-Employed	0.118	0.118	0.118	0.575
Filed a Tax Return	0.953	0.953	0.953	0.523
Return-Level, if Filed				
Married	0.551	0.555	0.547	0.000
Num. Claimed Children	1.815	1.814	1.816	0.568
AGI	113,069	114,312	111,893	0.000
Claimed Federal EITC	0.372	0.368	0.375	0.000
Claimed Federal CTC	0.899	0.898	0.900	0.128
Observations	496,404	241,288	255,116	

Notes: This table reports demographic and prior-year tax return characteristics for our main sample of recently working California mothers whose youngest child's sixth birthday falls within the four-month window around the end of the given year. Data includes cohorts for the following policy years: 2019, 2020, 2022, and 2023. Column 1 reports statistics for the full sample; Column 2 reports statistics for mothers of children whose birthday falls within the first four months of the subsequent year (age-eligible); Column 3 reports statistics for mothers of children whose birthday falls within the last four months of the year (age-ineligible); Column 4 reports the p-value for the test of equality between Columns 2 and 3. employment characteristics are based on third-party information returns; characteristics are based on tax return data and are only presented for individuals who filed a prior-year tax return.

Table A.2: YCTC Eligibility and Maternal Labor Supply: Robustness to Sample Selection

	(1)	(2)	(3)
	Work Req. (2019-2020/2021)	No Work Req. (2022-2023)	Diff-in-Diff [(2) - (1)]
Panel A: Claimed Child			
Coefficient	-0.014	-0.174	-0.160
	(0.105)	(0.109)	(0.152)
95% CI	[-0.220,0.192]	[-0.389,0.041]	[-0.457,0.137]
Control Mean	93.644	93.387	93.517
Observations	216,555	208,598	425,153
Panel B: Has Social Security Number			
Coefficient	-0.130	-0.101	0.030
	(0.101)	(0.098)	(0.140)
95% CI	[-0.327,0.067]	[-0.292,0.091]	[-0.245,0.304]
Control Mean	93.415	94.017	93.713
Observations	246,012	238,551	484,563
Panel C: Includes 2021			
Coefficient	-0.048	-0.168	-0.120
	(0.086)	(0.107)	(0.137)
95% CI	[-0.216,0.120]	[-0.377,0.041]	[-0.388,0.148]
Control Mean	92.542	92.564	92.551
Observations	376,026	244,759	620,785

Notes: The table tests the robustness of our main results in Table 1 to alternative sample restrictions. The main sample consists of recently working mothers in California whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. Panel A restricts the sample to mothers who claimed the focal child on their prior-year tax return. Panel B restricts the sample to mothers assigned a social security number. Panel C includes 2021, the year of the federal CTC expansion, in the analysis. The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Columns 1 and 2 compare labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Column 1 is estimated for years in which the YCTC contained a work requirement; Column 2 is estimated for years in which it did not. Column 3 corresponds to the difference in estimated effects between Columns 1 and 2. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table A.3: Summary Statistics by YCTC Age-Eligibility: Medicaid Sample

	(1)	(2)	(3)	(4)
	All	Age-Eligible (Jan-Apr)	Age-Ineligible (Sep-Dec)	p-value
Individual-Level				
Age	33.604	33.406	33.788	0.000
Any Income	0.669	0.670	0.669	0.647
Total Income	16,411	16,307	16,506	0.002
Self-Employed	0.082	0.082	0.083	0.592
Filed a Tax Return	0.861	0.861	0.862	0.266
Return-Level, if Filed				
Married	0.441	0.441	0.442	0.398
Num. Claimed Children	1.930	1.929	1.930	0.786
AGI	38,489	38,295	38,668	0.000
Claimed Federal EITC	0.589	0.589	0.589	0.614
Claimed Federal CTC	0.915	0.915	0.916	0.483
Observations	374,039	179,868	194,171	

Notes: This table reports demographic and prior-year tax return characteristics for our Medicaid sample of California mothers whose youngest child's sixth birthday falls within the four-month window around the end of the given year. Data includes cohorts for the following policy years: 2019, 2020, 2022, and 2023. Column 1 reports statistics for the full sample; Column 2 reports statistics for mothers of children whose birthday falls within the first four months of the subsequent year (age-eligible); Column 3 reports statistics for mothers of children whose birthday falls within the last four months of the year (age-ineligible); Column 4 reports the p-value for the test of equality between Columns 2 and 3. employment characteristics are based on third-party information returns; characteristics are based on tax return data and are only presented for individuals who filed a prior-year tax return.

Table A.4: YCTC Eligibility and Labor Force Participation: Medicaid and Census Samples

	Medicaid Sample		Census Sample	
	(1)	(2)	(3)	(4)
	Work Req. (2019-2020)	No Work Req. (2022-2023)	Work Req. (2019-2020)	No Work Req. (2022-2023)
Coefficient	0.052	0.278	0.072	0.268**
	(0.217)	(0.219)	(0.145)	(0.128)
95% CI	[-0.373,0.476]	[-0.152,0.707]	[-0.212,0.357]	[0.017,0.519]
Control Mean	65.888	67.582	70.5	68.6
Observations	191,766	182,273	400,000	530,000

Notes: This table reports the estimates from equation 2 for the Medicaid and Census samples, comparing labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Columns 1 and 3 are estimated for years in which the YCTC contained a work requirement; Columns 2 and 4 are estimated for years in which it did not. The Medicaid sample includes mothers of children enrolled in Medicaid in the state of California at any point during the prior year. The Census sample is comprised of birth mothers of children born in California; birth parents are identified from the Census Household Composition Key (CHCK) and birth location is according to the Social Security Administration (SSA) Numident file. For the Medicaid sample, the outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns. For the Census sample, the outcome is an indicator for positive wage income reported on a W-2 form; all counts and estimates are rounded per Census's disclosure rules governing administrative records. Units are percentage points (0-100). The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The Census Bureau has reviewed results from the Census sample to ensure ensure appropriate access, use, and disclosure avoidance protection of the confidential source data used to produce this product (Data Management System (DMS) Number: P-7503840, Disclosure Review Board (DRB) approval number: CBDRB-FY24-SEHSD003-066.)

Table A.5: YCTC and Low Earned Income Reporting

	(1)	(2)	(3)
	Work Req. (2019-2020)	No Work Req. (2022)	Diff-in-Diff [(2) - (1)]
Panel A: Earned Income between 1 and 500			
Coefficient	0.028	0.008	-0.020
	(0.019)	(0.017)	(0.025)
95% CI	[-0.008,0.064]	[-0.025,0.040]	[-0.069,0.028]
Control Mean	0.204	0.079	0.163
Observations	251,645	122,013	373,658
Panel B: Earned Income between 1 and 1,000			
Coefficient	0.055**	0.017	-0.039
	(0.026)	(0.025)	(0.036)
95% CI	[0.004,0.106]	[-0.032,0.065]	[-0.109,0.031]
Control Mean	0.399	0.177	0.326
Observations	251,645	122,013	373,658
Panel C: Earned Income between 1 and 5,000			
Coefficient	0.213***	0.113*	-0.100
	(0.063)	(0.066)	(0.091)
95% CI	[0.089,0.337]	[-0.016,0.242]	[-0.279,0.079]
Control Mean	2.497	1.272	2.094
Observations	251,645	122,013	373,658

Notes: The outcomes considered are indicators for reporting positive earned income less than $500 (Panel A), $1,000 (Panel B), and $5,000 (Panel C). Outcomes take on a value of zero if the individual did not file a tax return. Units are percentage points (0-100). Columns 1 and 2 compare labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Column 1 is estimated for years in which the YCTC contained a work requirement; Column 2 is estimated for years in which it did not and for which income reporting data is available. Column 3 corresponds to the difference in estimated effects between Columns 1 and 2. The sample consists of recently working mothers in California whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. The control mean corresponds to mothers of age ineligible children. Parentheses report heteroskedasticity-robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Alternative Specification: YCTC Eligibility and Labor Supply

	(1)	(2)	(3)
	Work Req. (2019-2020)	No Work Req. (2022-2023)	Diff-in-Discontinuity [(2) - (1)]
Coefficient	-0.303	-0.361	-0.058
	(0.738)	(0.766)	(1.064)
95% CI	[-1.750,1.144]	[-1.862,1.140]	[-2.143,2.027]
Control Mean	92.808	92.674	92.742
Observations	47,546	46,165	93,711

Notes: This table presents regression discontinuity estimates for the labor market impacts of eligibility for the YCTC among recently working California mothers. The sample consists of children born in last four weeks of the year and the first four weeks of the subsequent year, excluding those whose dates of birth fall within an 8-day period surrounding January 1st. Regressions include a linear time trend and an interaction between a linear time trend and an indicator for whether the mother is age-eligible for the YCTC during the specified year. Columns 1 and 2 compare mothers of age-eligible versus age-ineligible children in the years before and after the elimination of the YCTC work requirement, respectively. Column 3 presents the differences of these two estimates, i.e., the difference-in-discontinuities estimate. The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table A.7: YCTC Eligibility and Labor Supply: California vs. Other States

	(1)	(2)	(3)
	Work Req. DiD (2019-2020)	No Work Req. DiD (2022-2023)	Triple Difference [(2) - (1)]
Coefficient	-0.067	-0.161	-0.094
	(0.110)	(0.117)	(0.160)
95% CI	[-0.283,0.149]	[-0.389,0.067]	[-0.408,0.220]
Control Mean	93.91	93.11	93.51
Observations	2,002,380	1,972,164	3,974,544

Notes: The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Columns 1 and 2 compare labor force participation of California mothers of age-eligible versus age-ineligible children to mothers of same-aged children in different states. Column 1 is estimated for years in which the YCTC contained a work requirement; Column 2 is estimated for years in which it did not. Column 3 presents the triple-difference estimator, i.e., the interaction of indicators for being in the no work requirement period, having an age-eligible child, and living in California residency, controlling for the corresponding main effects, two-way interactions, and year fixed effects. The sample consists of recently working mothers whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. Analyses exclude mothers in Colorado, Maryland, New Jersey, Oregon, and Vermont. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table A.8: YCTC Eligibility and Labor Supply by Year During the Work Requirement

	(1)	(2)	(3)	(4)
	2019	2020	2021	2019-2021
Age-Eligibile x CA	-0.055	-0.097	0.125	-0.099
	(0.153)	(0.157)	(0.163)	(0.141)
Age-Eligibile x CA x Year				0.090
				(0.112)
Control Mean	94.159	93.688	93.248	93.696
Observations	1,073,539	1,094,902	1,082,668	3,251,109

Notes: The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Columns 1 through 3 present the effect of YCTC age-eligibility by comparing labor force participation of California mothers of age-eligible versus age-ineligible children to mothers of same-aged children in different states in 2019 through 2021, respectively. Column 4 includes the samples for 2019 through 2021 adding an interaction between the indicator for YCTC age-eligibility (i.e., age-eligible and living in California) and a continuous year variable along with year by California fixed effects and year by age-eligibility fixed effects. The sample consists of recently working mothers whose youngest child's sixth birthday falls within the four-month window around the end of the specified year. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

Table A.9: Estimated YCTC Take-Up Among Federal Filers

	Number of Claimants			Total Credit Amount ($ mil)		
	(1)	(2)	(3)	(4)	(5)	(6)
	Claimed	Eligible	Takeup (%)	Claimed	Eligible	Takeup (%)
2019	428,857	517,406	82.9	389	465	83.7
2020	416,980	453,675	91.9	388	401	96.7
2019-2020	845,837	971,081	87.1	777	866	89.7

Notes: The Table estimates YCTC take-up among federal tax filers. Take-up is estimated by comparing reported YCTC claiming statistics reported by the California Franchise Tax Board (FTB) to simulated YCTC eligibility for California federal tax filers claiming one or more children under the age of six. Calculations are conducted at the tax return level. Actual claim data regarding the number of YCTC claimants and the total dollars of YCTC claimed is derived from California Franchise Tax Board (2019) and the subsequent report for 2020. Simulated YCTC eligibility among federal filers is based on the YCTC credit formula and information reported on the federal return. For purposes of this exercise, we treat as eligible for the YCTC any federal filer satisfying the following criteria: had a California address; claimed at least one child below the age of six for either the federal CTC or EITC; reported Adjusted Gross Income under $30,000; reported positive wages or Schedule C profit; reported taxable interest and dividends below $3,828 for 2019 returns or $3,882 for 2020 returns; did not file as married filing separately; filed the federal return before the close of the calendar year following the tax year; and both the filer and child possessed a valid SSN.

B Implied Labor Supply Elasticity

In this Appendix, we translate our labor supply estimates from the elimination of the YCTC work requirement into labor force participation elasticities with respect to the return to work. We calculate elasticities that correspond to both our point estimate and to the lower-bound of our estimated 95% confidence interval.

The labor supply elasticity we consider is defined as:

$$\frac{\%\Delta \text{ labor supply}}{\%\Delta \text{ return to work}} \tag{1}$$

where the numerator is calculated as:

$$\frac{\Delta \text{ labor supply}}{\text{share of sample working}} \tag{2}$$

The terms in (2) follow directly from our main results. The numerator in (2) represents the estimated change in labor supply from eliminating the YCTC work requirement (Column 3 of Table 1). We measure the denominator of (2) based on the share of mothers with positive earned income during the outcome year, averaged over the years of our analysis.

The denominator in (1) is given by:

$$\frac{\Delta \text{ return to work}}{\text{ATT(working)-ATT(non-working)}} \tag{3}$$

where ATT denotes after-tax-and-transfer income. The denominator, ATT(working) - ATT(non-working), thus represents the economic return to working.

The numerator in (3) is equal to the reform-induced change in the financial benefits of working relative to not working. In our setting, this quantity is equal -\$1,000 for all individuals with children whose ages qualify them for the YCTC. Because individuals are no longer required to work to claim the credit, elimination of the work requirement increases the return to not working by \$1,000. Hence, it reduces the net return to work by \$1,000.

The denominator in (3) represents the average financial benefit of working relative to not working, accounting for taxes and transfers. The first term represents the average after-tax and transfer income of individuals in our sample if they choose to work, and the second term represents the average after-tax and transfer income of individuals in our sample if they choose not to work.

We calculate the after-tax-and-transfer return to working for various income levels ranging from \$1 to \$100,000 and calculate taxes (including refundable tax credits) using NBER's TAXSIM. We model transfers as the value of SNAP benefits that a household is eligible for given their household income and household size, using the benefit formula for the federal SNAP program. For the after-tax-and-transfer return to not working, we assume that if households have no earned income, they receive the maximum SNAP benefits available given their household size.[38]

[38] Households that do not work are technically eligible for other programs such as cash welfare. Because

The results of this exercise are reported in Table B.1. The first column presents results for the full sample; the remaining columns present results for three sub-groups: married mothers; single mothers who claim the EITC; and single mothers who do not claim the EITC. We split single mothers in this way because prior estimates predicting the number of parents exiting the labor force were particularly focused on the labor supply responses of single mothers with income in the EITC-eligible range (e.g. Corinth et al. 2021; Bastian Forthcoming).[39]

The first two rows of Table B.1 present the change in the return to work associated with the removal of the YCTC work requirement (a $1,000 reduction in the return to work) and the mean percent change in the return to work that this $1,000 represents for each sub-sample. For our full sample, households who worked in the prior year, the $1,000 decline in the return to work corresponds to a roughly 6 percent reduction in the return to work.

The remaining rows of Table B.1 present calculations for the numerator of the labor supply elasticity, using both our main point estimates as well as the lower bound of our estimated 95% confidence interval. For the full sample, we observe a 0.06 percentage point decline in employment from the elimination of the YCTC work requirement, which represents a 0.07 percent change in employment for this population. This implies an elasticity of $0.0007/0.061 = 0.011$.

Using instead our lower bound labor supply estimate, which implies a 0.352 percentage point decline in labor force participation from the removal of the YCTC work requirement, we obtain a labor supply elasticity for the full sample of 0.063.

We repeat this exercise by marital status and EITC-claiming. We focus our discussion on the lower-bound employment responses, which imply larger labor supply elasticities than our main point estimates.We estimate a labor supply elasticity of 0.08 for married mothers. We find fairly comparable labor supply elasticities for single mothers, regardless of whether they claim the EITC: we estimate a labor supply elasticity of 0.137 for single mothers who did not claim the EITC, and 0.132 for single mothers who did claim the EITC.

Overall, these labor supply elasticities are toward the lower end of the range of previous estimates (McClelland and Mok, 2012) and consistent with other work that has found that labor supply elasticities have declined over the last several decades (see Bastian (Forthcoming) for a review). These estimates are also consistent with the empirical evidence on the lack of a substantial labor supply responses to 2021 federal CTC expansion (Ananat et al., 2022; Enriquez, Jones and Tedeschi, 2023; Pac and Berger, 2024).

take up of those benefits tend to hover in the 20-30% range, we disregard the value of cash welfare for this exercise.

[39]Note that single mothers who do not claim the EITC includes both single mothers with zero earnings in the tax year, as well as single mothers with earnings above the EITC-eligible range. Since we limit our sample to individuals who were working in the prior year, the number of single mothers with zero earnings is quite small.

Table B.1: Elasticity of Labor Force Participation with Respect to Return to Work

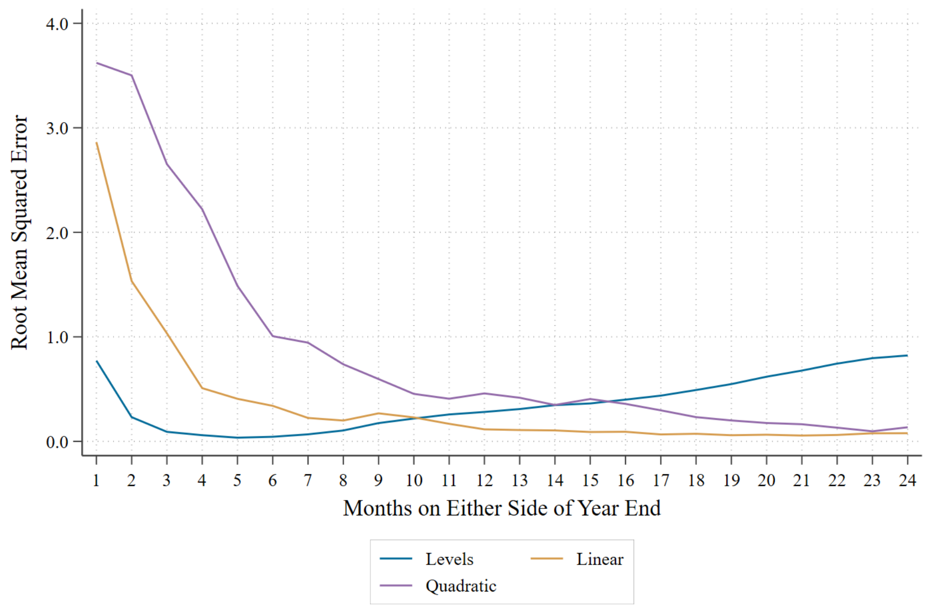
	(1) Full Sample	(2) Married	(3) EITC & Single	(4) No EITC & Single
Mean Return to Work				
Change in Return to Work	-1,000	-1,000	-1,000	-1,000
Percent Change in Return to Work	-6.021	-6.425	-6.442	-3.170
Point Estimate				
Employment Effect	-0.061	-0.057	-0.286	0.209
Percent Change in Employment	-0.066	-0.062	-0.305	0.217
Elasticity	0.011	0.010	0.047	-0.069
95% Confidence Interval Lower Bounds				
Employment Effect	-0.352	-0.456	-0.795	-0.418
Percent Change in Employment	-0.377	-0.492	-0.847	-0.435
Elasticity	0.063	0.077	0.132	0.137

Notes: This table reports estimated labor supply elasticities based on the point estimates and lower bound of the estimated 95% confidence intervals from Table 1.

C Colorado Child Tax Credit Analysis

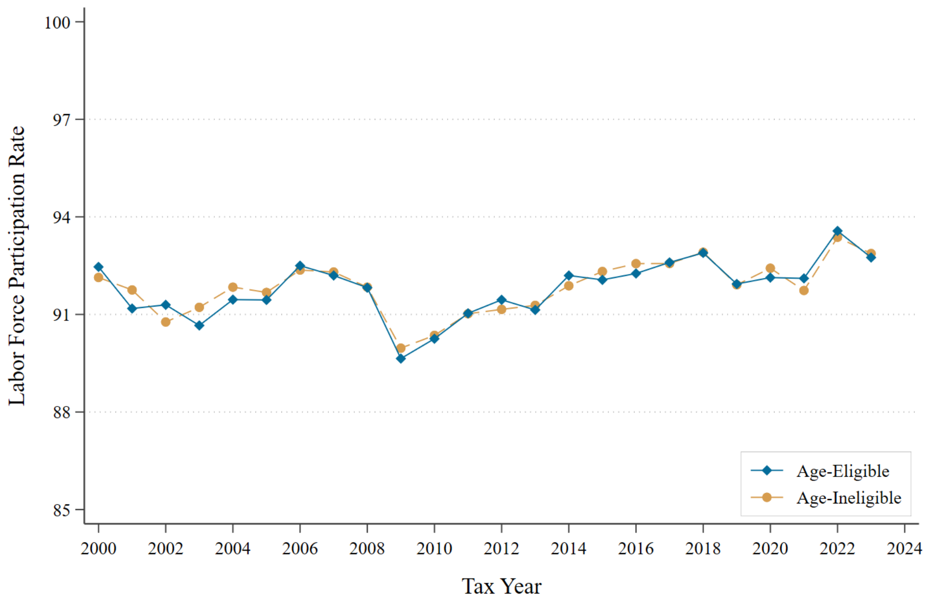
This Appendix Section replicates our main analysis for the reform to the Colorado Child Tax Credit, as described in Section 6.1 of the main text.

Figure C.1: Root Mean Squared Error by Specification and Bandwidth for Colorado CTC Analysis



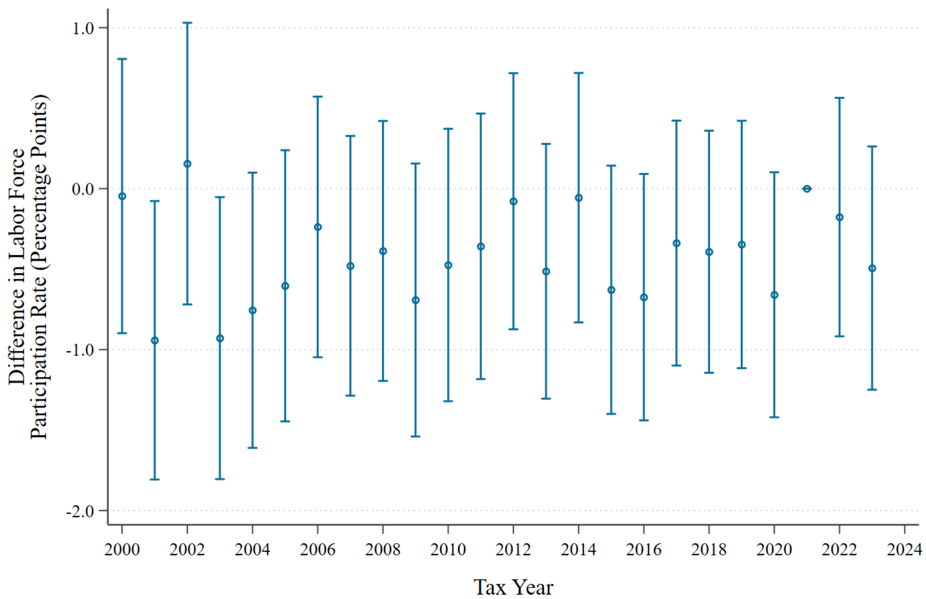
Notes: The figure reports the results of the exercise described in Section 4.1, comparing the root mean squared error (RMSE) of the distribution of estimated (placebo) effects for different empirical specifications. Each placebo effect is obtained from estimating the effect of age-eligibility for the Colorado Child Tax Credit following equation (1), for each year from 2005 through 2020. Each estimate is obtained from a sample composed of Colorado mothers with a child whose sixth birthday falls within the specified number of months on either side of the end of the specified year. The reported RMSE corresponds to the square root of the average (across years) of the square of the estimated coefficients from each year. The three lines correspond to estimating equations that vary in the date of birth polynomial included in the implementation of equation (1). The purple line includes a quadratic polynomial in date of birth; the yellow line includes a linear trend in date of birth; and the blue line consists of a simple comparison of means of the age-eligible and age-ineligible groups of mothers.

Figure C.2: Maternal Labor Force Participation by Colorado CTC Age-Eligibility and Year



Notes: The figure reports labor force participation rates by year for the Colorado sample. The sample consists of Colorado mothers who had positive positive wage or self-employment income reported on third-party information returns during the previous tax year and who has a child whose child's sixth birthday falls within the five-month window around the turn of the specified year. Mothers whose child turns six during the last five months of a year (age-ineligible group) are reported in yellow; mothers whose child turns six during the first five months of the subsequent year (age-eligible group) are reported in blue. Labor force participation is defined as having positive wage or self-employment income reported on third-party information returns.

Figure C.3: Difference in Maternal Labor Force Participation by Colorado CTC Age-Eligibility and Year



Notes: The figure reports yearly differences in labor force participation rates between age-eligible and age-ineligible mothers in our Colorado sample. The sample consists of Colorado mothers who had positive wage or self-employment income reported on third-party information returns during the previous tax year and whose child's sixth birthday falls within the five-month window around the turn of the specified year. The age-ineligible group consists of mothers whose child turns six during the last five months of a year; the age-eligible group consists of mothers whose child turns six during the first five months of the subsequent year. Labor force participation is defined as having positive wage or self-employment income reported on third-party information returns. Coefficient estimates are reported in percentage points (0-100). Bars represent the estimated 95% confidence intervals.

Table C.1: Summary Statistics by Colorado CTC Age-Eligibility

	(1)	(2)	(3)	(4)
	All	Age-Eligible (Jan-May)	Age-Ineligible (Aug-Dec)	p-value
Individual-Level				
Age	34.342	34.134	34.536	0.000
Any Income	1.000	1.000	1.000	.
Total Income	50,367	50,189	50,534	0.382
Self-Employed	0.169	0.168	0.170	0.551
Filed a Tax Return	0.942	0.942	0.942	0.854
Return-Level, if Filed				
Married	0.670	0.672	0.667	0.160
Num. Claimed Children	2.078	2.072	2.084	0.136
AGI	119,169	119,064	119,266	0.840
Claimed Federal EITC	0.319	0.320	0.317	0.460
Claimed Federal CTC	0.915	0.915	0.914	0.408
Observations	74,853	36,112	38,741	

Notes: This table reports demographic and prior-year tax return characteristics for our main sample of recently working Colorado's mothers whose youngest child's sixth birthday falls within the five-month window around the end of the given year. Data includes cohorts for the following policy years: 2022, and 2023. Column 1 reports statistics for the full sample; Column 2 reports statistics for mothers of children whose birthday falls within the first five months of the subsequent year (age-eligible); Column 3 reports statistics for mothers of children whose birthday falls within the last five months of the year (age-ineligible); Column 4 reports the p-value for the test of equality between Columns 2 and 3. employment characteristics are based on third-party information returns; characteristics are based on tax return data and are only presented for individuals who filed a prior-year tax return.

Table C.2: Colorado CTC Eligibility and Maternal Labor Supply

	(1)	(2)	(3)
	Work Req. (2022)	No Work Req. (2023)	Diff-in-Diff [(2) - (1)]
Coefficient	0.195	-0.122	-0.317
	(0.256)	(0.267)	(0.370)
95% CI	[-0.306,0.696]	[-0.645,0.401]	[-1.041,0.408]
Control Mean	93.374	92.874	93.126
Observations	37,363	37,490	74,853

Notes: The outcome in each column is an indicator for having positive wage or self-employment income reported on third-party information returns; units are percentage points (0-100). Columns 1 and 2 compare labor force participation among mothers whose youngest child is below the age of six in the specified year to mothers whose youngest child is above the age of six in that year. Column 1 is estimated for years in which the CTC contained a work requirement; Column 2 is estimated for years in which it did not. Column 3 corresponds to the difference in estimated effects between Columns 1 and 2. The sample consists of recently working mothers in Colorado with a child whose sixth birthday falls within the five-month window around the end of the specified year. The control mean corresponds to mothers of age-ineligible children. Parentheses report heteroskedasticity-robust standard errors.

D Work Requirement Earnings Threshold and Labor Participation Response

This Appendix Section considers a simple labor supply model to study how taxpayers respond to the YCTC work requirement as compared to work requirement tied to higher earned income thresholds.

Let $u(l)$ refer to the net utility benefit in money-metric units to an individual from working $l \geq 0$ units. This encompasses any tax implications or other program benefits other than the new program being considered (e.g., the YCTC).

We will consider an individual to be working if $l \geq 1$.

Absent any new program, an individual will choose to work if the utility from working exceeds the utility from not working, for some positive amount of work $l \geq 1$. Thus, the individual will choose to work if and only if the utility associated with the optimal amount of positive work, u_1, exceeds the utility from not working, u_0, where

$$u_1 := \max_l u(l) \text{ s.t. } l \geq 1$$

and u_0 is normalized to zero. The share of the population who works (absent the work requirement under consideration) is therefore given by $Pr(u_1 > 0)$.

Consider the introduction of a benefit program with a work requirement that provides Y dollars if an individual works at least $k \geq 1$ units, and provides no benefit otherwise. We will refer to this policy as B_k.

Under this policy, if an individual works at least k units, the individual's utility is given by $u_k + Y$, where

$$u_k := \max_l u(l) \text{ s.t. } l \geq k$$

Note that by construction, $k' > k$ implies $u_k \geq u_{k'}$. This follows from the fact that $u_{k'}$ and u_k are defined to equal the maximum of the same function, but the set over which the former is evaluated is a strict subset of the set over which the latter is evaluated: $\{l : l \geq k'\} \subset \{l : l \geq k\}$.

Under policy B_k, an individual's utility from working is the maximum of u_1 and $u_k + Y$. Intuitively, either the individual chooses to work at least k, in which case they obtain utility $u_k + Y$, or they work some positive amount less than k, in which case they would continue to receive u_1 (i.e., the best they could obtain absent the benefit program with the work requirement). Thus, under policy B_k, the individual will work if and only if $u_1 > 0$ or $u_k + Y > 0$. The share of the population that works is thus given by: $Pr(u_1 > 0) + Pr(u_1 \leq 0 \text{ \& } u_k \geq -Y)$.

Thus, the effect of introducing policy B_k on the share of the population that works, β_k, is given by:

$$\begin{aligned}
\beta_k &= \underbrace{Pr(u_1 > 0) + Pr(u_1 \leq 0 \;\&\; u_k + Y \geq 0)}_{\text{Share Working Under } B_k} - \underbrace{Pr(u_1 > 0)}_{\text{Share Working Absent } B_k} \\
&= Pr(u_1 \leq 0 \;\&\; u_k + Y \geq 0) \\
&= Pr(u_k + Y \geq 0 \mid u_1 \leq 0)\, Pr(u_1 \leq 0)
\end{aligned}$$

Finally, note that for any $k' > k$, we have:

$$\begin{aligned}
\beta_{k'} &= Pr(u_{k'} + Y \geq 0 \mid u_1 \leq 0)\, Pr(u_1 \leq 0) \\
&\leq Pr(u_k + Y \geq 0 \mid u_1 \leq 0)\, Pr(u_1 \leq 0) \\
&= \beta_k
\end{aligned}$$

where the inequality follows from the fact (discussed above) that for each individual $k' > k$ implies $u_k \geq u_{k'}$.