The Effects of the Child Tax Credit on Labor Supply

Kye Lippold[1]

Office of Tax Analysis, U.S. Treasury

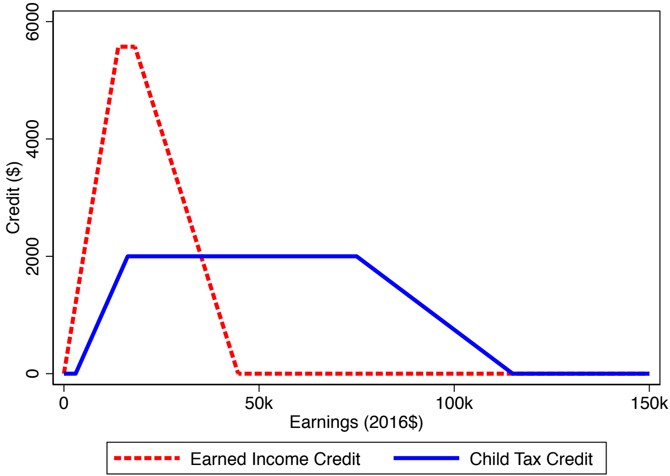
FCSM Conference
October 2022

1. Email: Kye.Lippold@treasury.gov. Opinions and conclusions expressed are those of the author and do not necessarily represent the views or policies of the U.S. Department of the Treasury.

Motivation

- Tax credits subsidizing work, such as the Earned Income Tax Credit (EITC) and Child Tax Credit (CTC) attract bipartisan policy interest
- EITC has positive effects on labor supply, health and education (Meyer and Rosenbaum 2001; Dahl and Lochner 2012; Hoynes, Miller, and Simon 2015)
- Most EITC research based on expansions in early 1990s
  - Recent work has questioned labor supply findings (Kleven 2021)
  - Evidence that labor supply elasticities have declined since 1990s
  - What does this imply for future credit expansions, like changes to the CTC in the American Rescue Plan?
- The CTC provides a new source of evidence on low-income tax credits
  - Little studied (Hoynes and Rothstein 2016)
  - Offers new identification strategy with discontinuity at age 17

CTC and EITC for Single Parent with Two Children, 2016

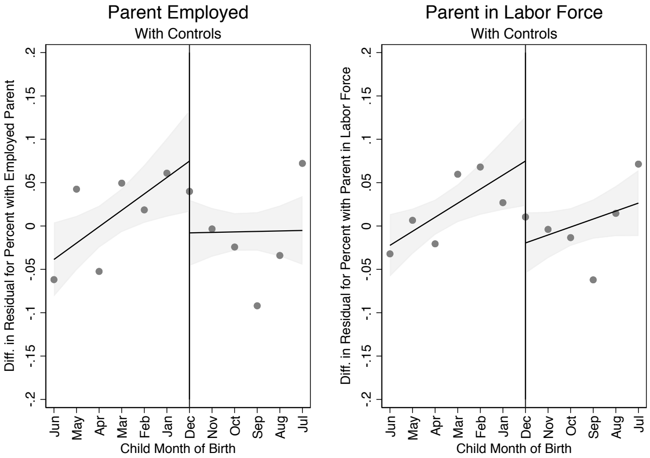


Source: Author's calculations using Taxsim. Calculations assume no unearned income or itemized deductions.

This Study

- Determine the labor supply impacts of the CTC
  - Focusing on extensive margin (strongest EITC effects)
- Approach: difference in regression discontinuities (DiRD)
  - Families claim the CTC until their child turns 17
    - The EITC, dependent exemption, going to college (etc.) change when children turn 18 or 19
  - Counterfactual:
    - Children who are born on January 1st, 1994 give their parents a full CTC for 2010
    - Children who are born on December 31st, 1993 give no CTC for 2010
  - Method controls for preexisting seasonal differences

Preview of Main SIPP Results (DiRD)

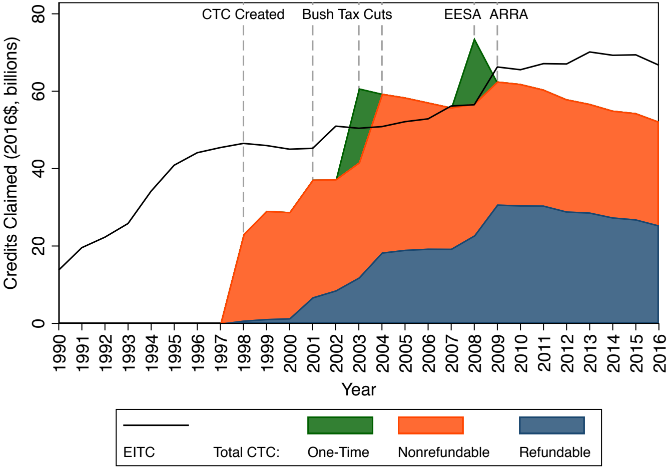


Notes: Estimated with local linear regressions, uniform kernels, 6-month bandwidths, on residuals of control variables. Shaded areas are 90 percent confidence intervals.

Contribution

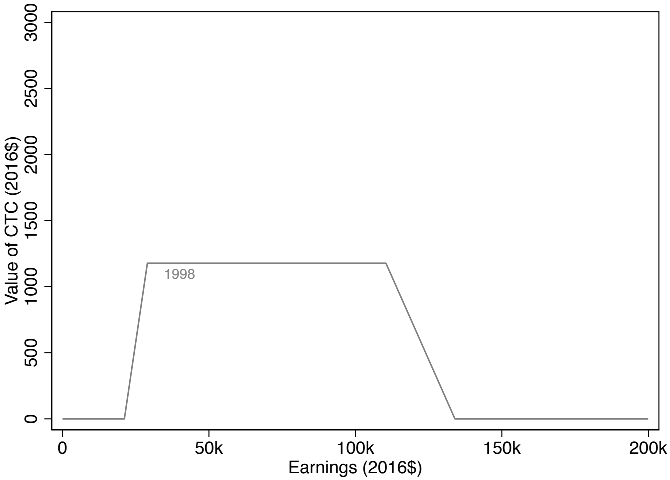
- Inform recent debate on earlier EITC literature (Kleven 2021)
  - CTC provides alternative identification strategy to test robustness
- Estimates of intertemporal substitution elasticity of labor supply
  - No wealth effects in this setting, only price effects (anticipated, temporary variation)
  - (in paper) Develop model to compare responses to temporary versus permanent tax changes
- Inform policy for new credit expansions
  - CTC expanded as part of Tax Cuts and Jobs Act (TCJA)
  - California young child CTC (July 2019)
  - Strength of labor supply effects for fully refundable CTC (Acs and Werner 2021; Goldin, Maag, and Michelmore 2022; Corinth et al. 2022)

Expenditures on the CTC and EITC over Time



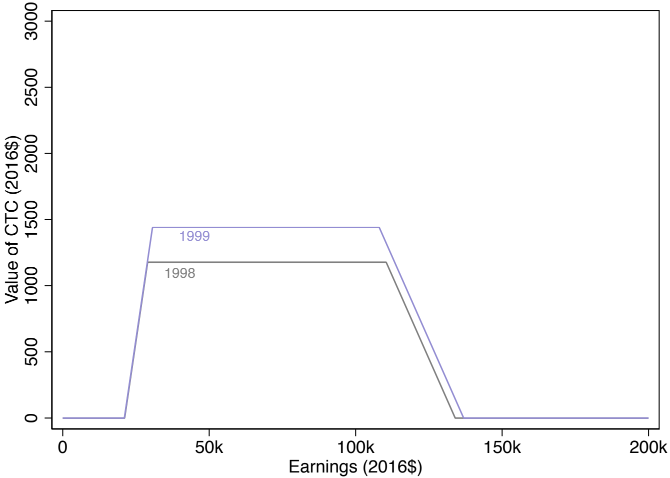
Source: Author's calculations from IRS Statistics of Income data.

Value of the CTC Over Time



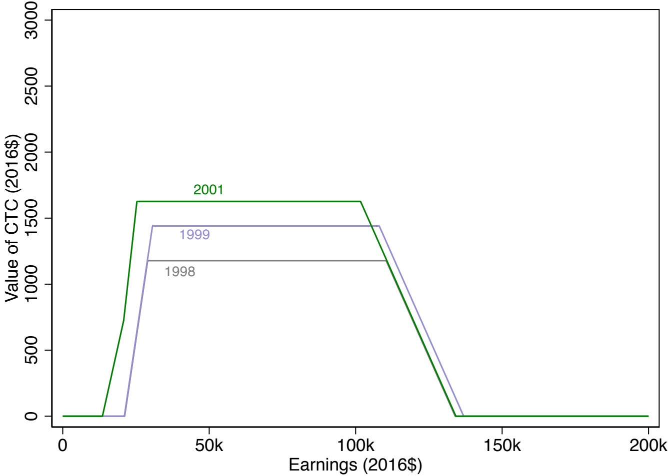
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



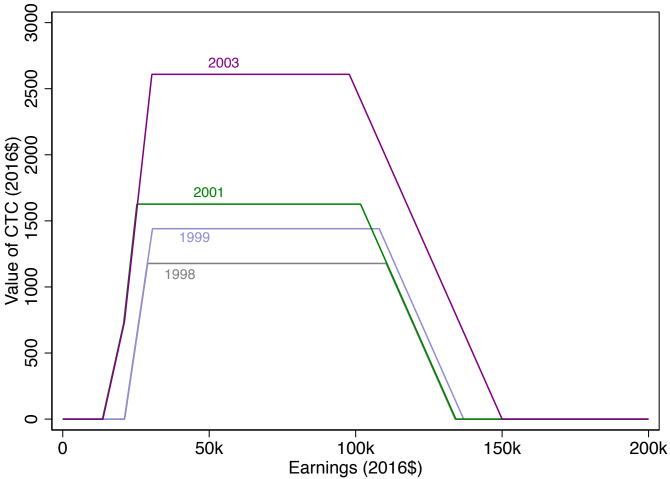
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



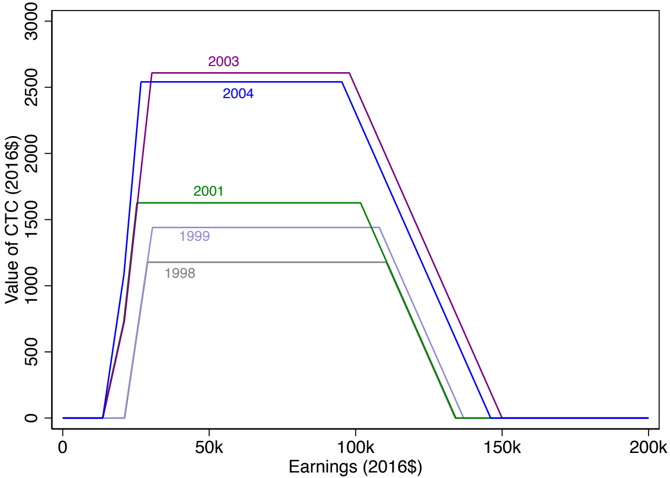
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



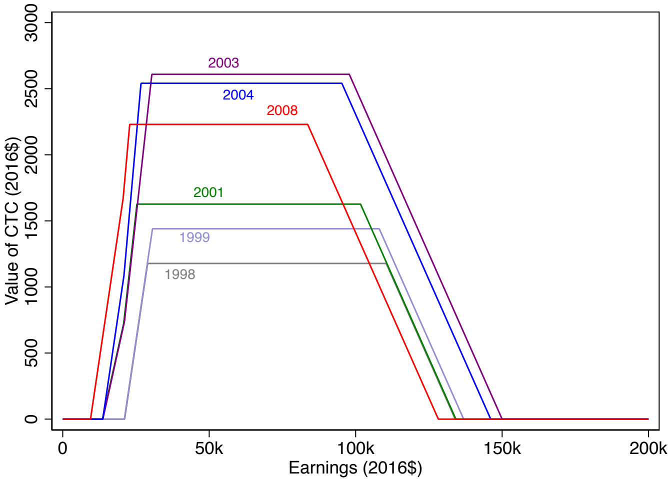
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



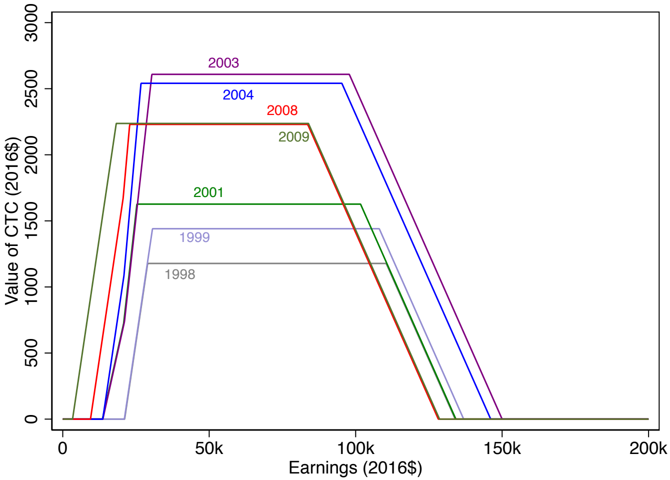
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



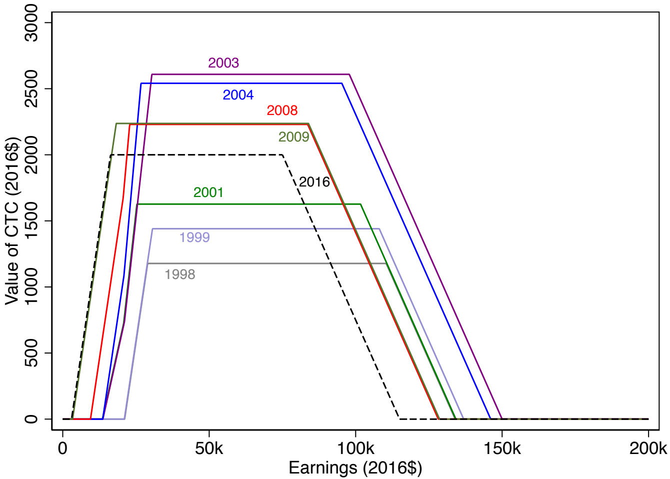
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



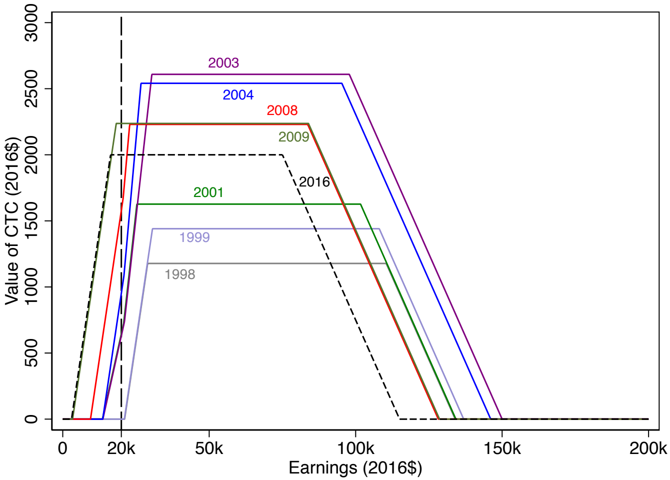
Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Value of the CTC Over Time



Source: Author's calculations using Taxsim. Figures are for single parent with two children, no unearned income, and no itemized deductions.

Literature - CTC and December Discontinuities

- Several papers use similar identification strategy (e.g. Nichols, Sorensen, and Lippold (2012))
- Feldman, Katuščák, and Kawano (2016): Loss of CTC for middle-income households, where credit is lump sum
  - Intensive margin elasticity of 0.3 in year *after* age 17 (misperception), no age 17 effect
  - Looks at higher income group and different margin of response
- Looney and Singhal (2006): Children aging out of dependent status
  - Intensive intertemporal substitution elasticity of 0.75
  - Dependency endogenous with college enrollment
- Wingender and LaLumia (2017): Extra tax benefits from December births lead new mothers to work less
  - Looks at unanticipated variation in income, rather than anticipated variation in wages
  - This study looks at future effects of birth timing decision

Data

- Survey of Income and Program Participation (1984-2014 panels)
  - Panel data for 3-5 years; focus on 2001-2016, before TCJA
  - Detailed information on demographics, income, family structure, and birth month
  - Tax information from Taxsim (Feenberg and Coutts 1993)
- Sample: Children ages 13.5-17.5 in the survey at end of year, prior year AGI of $20,000 or below
  - Child's age (in months) provides running variable
    - Standardize ages, exclude imputed values
  - Limit to children linked to parents in tax unit, observed for 8+ months in current and prior year
    - Impute incomes for partial years following Looney and Singhal (2006)

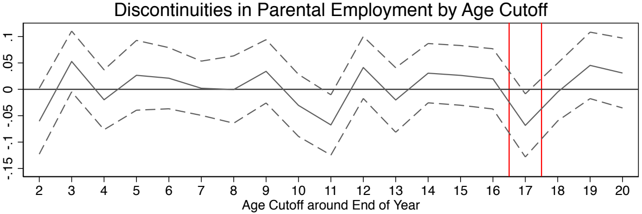
Identification

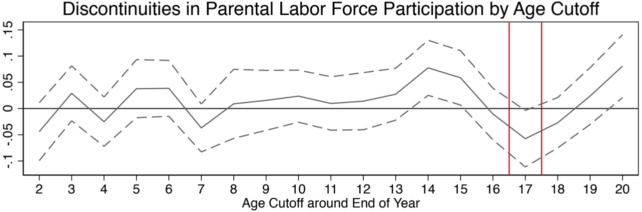
- Compare children born just above age 17 cutoff to just below cutoff
  - Birthday one day before cutoff removes entire credit for the year
- Other programs do not typically change at the cutoff
  - Dependent exemption and EITC end at age 19 (or age 24 if the child is a full-time student)
  - Child care credit and child care subsidies end at age 13
  - Children receive special treatment under SSI and SNAP until age 18
  - TANF rules change at age 16, 18 or 19 depending on the state and child's student status
  - Medicaid and CHIP end at age 19
  - WIC benefits end at age 5
  - (All parameters taken from Urban Institute (2019))

Identification

- Caveats: birth timing and seasonality
- Long literature that some parents time births to gain eligibility for credits (Dickert-Conlin and Chandra 1999; Gans and Leigh 2009; Schulkind and Shapiro 2014)
    - My cutoff is affected by retiming, but 17 years later
    - LaLumia, Sallee, and Turner (2015) finds shifts are small (about 1% of births moved)
- Seasonal trends in outcomes (Buckles and Hungerman 2013; Schulkind and Shapiro 2014; Bound and Jaeger 1996)
    - December and January parents differ on observables
- Exacerbated because my SIPP birthdate data is at monthly level

Trends in Seasonality





Notes: Estimated with local linear regressions, uniform kernels, 6-month bandwidths, on residuals of control variables. Dashed lines are 90 percent confidence intervals.

Difference-in-Regression Discontinuities (DiRD)

- Hybrid of DiD and RD designs (Grembi, Nannicini, and Troiano 2016)
- Approach to deal with seasonality
  - Difference out December / January differences at earlier ages
- Identifying assumptions:
  - Seasonal differences are constant over time
  - The effect of the CTC does not depend on seasonality (that is, parents with children born in different months respond similarly to the incentives)

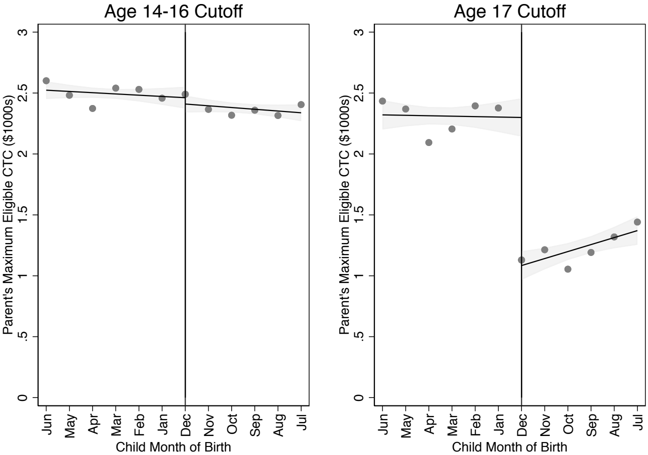
Model

- Linear probability model

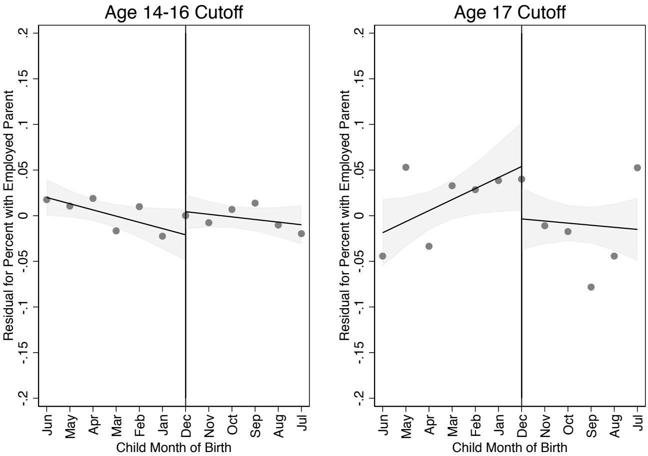
$$
\begin{aligned}
y_{it} = \alpha + \delta D_{it} + \phi_1 A_{it} D_{it} + \phi_2 A_{it} \left(1 - D_{it}\right) \\
+ \left(\gamma + \beta D_{it} + \phi_3 A_{it} D_{it} + \phi_4 A_{it} \left(1 - D_{it}\right)\right) T_{it} \\
+ \theta X_{it} + \epsilon_{it}
\end{aligned}
$$

- y_{it} is indicator of parental work for child i in year t
- A_{it} is the age of the child (in months relative to December of that year)
- D_{it} is a discontinuity ($A_{it} \geq 0$)
- T_{it} indicates the age 17 cutoff (as opposed to earlier ages)
- X_{it} are controls
- Using December weights, clustered by panel / variance strata

First Stage

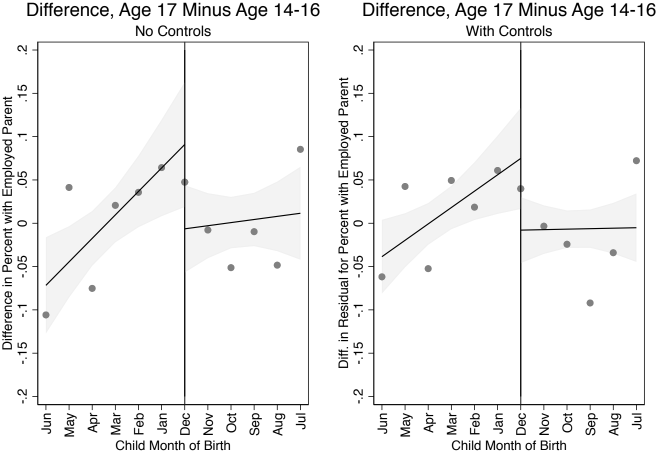

Age 14-16 Cutoff
Age 17 Cutoff
Parent's Maximum Eligible CTC ($1000s)
0
.5
1
1.5
2
2.5
3
Jun
May
Apr
Mar
Feb
Jan
Dec
Nov
Oct
Sep
Aug
Jul
Child Month of Birth

RDs for Parental Employment



Notes: Estimated with local linear regressions, uniform kernels, 6-month bandwidths, on residuals of control variables. Shaded areas are 90 percent confidence intervals. ▸ Raw ▸ All Ages

DiRD for Parental Employment



Notes: Estimated with local linear regressions, uniform kernels, 6-month bandwidths, on residuals of control variables. Shaded areas are 90 percent confidence intervals.

DiRD Results for Primary Sample

	Parent Employed			Parent in Labor Force		
	(1)	(2)	(3)	(4)	(5)	(6)
Diff in Disc.	-0.097*	-0.087*	-0.084**	-0.107**	-0.091**	-0.096**
	(0.054)	(0.044)	(0.042)	(0.048)	(0.040)	(0.039)
Age 16.5+ (Post)	0.091**	0.067*	0.076**	0.086**	0.067**	0.076**
	(0.044)	(0.038)	(0.035)	(0.039)	(0.034)	(0.032)
December Disc.	-0.007	0.021	0.026	0.025	0.034*	0.042**
	(0.036)	(0.021)	(0.021)	(0.034)	(0.018)	(0.019)
Lagged DV		Yes	Yes		Yes	Yes
Controls			Yes			Yes
N	9,443	9,443	9,443	9,443	9,443	9,443
Clusters	1,034	1,034	1,034	1,034	1,034	1,034

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

Fuzzy RD and Elasticity Estimates

	(1) Employed	(2) In Labor Force
(A) Parent Employed / In LF		
Diff in Disc.	-0.084**	-0.096**
	(0.042)	(0.038)
(B) Maximum Eligible CTC ($1,000s)		
Diff in Disc.	-1.049***	-1.048***
	(0.065)	(0.065)
(C) Percent Working / LFP (lag)		
Mean	0.608***	0.723***
	(0.009)	(0.009)
(D) Return to Work / LFP (lag, $1,000s)		
Mean	7.928***	4.683***
	(0.396)	(0.437)
ITT Estimate	0.080*	0.091**
$(= A/B)$	(0.041)	(0.038)
Elasticity at Average	1.040*	0.591**
$(= (A/C)/(B/D))$	(0.539)	(0.251)
N	9,443	9,443
Clusters	1,034	1,034

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Return to work is computed as difference in post-tax income between working and non-working parents (and likewise for LFP). Fuzzy RD and elasticity standard errors are computed using the delta method. Controls are year and state fixed effects and parental characteristics (see text).

Elasticity at Steady State

- Use equation from dynamic model

$$\varepsilon_I \approx \left(\frac{1 - \frac{\gamma W_t}{1-s_t}\left(1 - \frac{2\alpha}{1+r_t} + \frac{(2+r_t)\alpha^2}{(1+r_t)^2}\right)}{1 - \frac{\gamma W_t}{1-s_t}} \right) \epsilon_S$$

  calibrated based on other literature.
- Yields estimates of extensive margin steady-state labor supply elasticity:
  - 0.43 for employment
  - 0.47 for labor force participation
- Close to estimates from EITC literature (e.g. 0.43 in Meyer and Rosenbaum (2001), as calculated by Chetty (2012))

Results by Entry or Exit Status

	Employed		In Labor Force	
	(1) Entry	(2) Exit	(3) Entry	(4) Exit
Diff in Disc.	-0.108	-0.046	-0.182**	-0.060*
	(0.080)	(0.041)	(0.090)	(0.034)
Age 16.5+ (Post)	0.117*	0.037	0.164**	0.037
	(0.066)	(0.033)	(0.070)	(0.028)
December Disc.	0.026	0.005	0.060	0.022
	(0.042)	(0.022)	(0.045)	(0.019)
Controls	Yes	Yes	Yes	Yes
N	3,695	5,748	2,609	6,834
Clusters	810	931	696	971

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

Conclusion

- Extensive margin response to the CTC equal to or above the EITC
  - Relies on DiRD assumptions of constant seasonality, but strongest in the subgroups where expected
  - Reinforces earlier literature
- Elasticity is higher given temporary tax change
  - Provides evidence of timing response (similar to capital gains realizations)
- Tax credits can still have strong labor supply effects
- Future work
  - Replicate with higher precision datasets (SIPP Gold Standard files, CDW data)
  - Investigate responses to new expansions

References

Acs, Gregory, and Kevin Werner. 2021. *How a Permanent Expansion of the Child Tax Credit Could Affect Poverty.* Washington, DC: Urban Institute. https://www.urban.org/research/publication/how-permanent-expansion-child-tax-credit-could-affect-poverty.

Bound, John, and David Jaeger. 1996. "On the Validity of Season of Birth as an Instrument in Wage Equations: A Comment on Angrist and Krueger's 'Does compulsory school attendance affect schooling and earnings?'" *NBER Working Paper,* no. 5835, https://doi.org/10.3386/w5835.

Buckles, Kasey S., and Daniel M. Hungerman. 2013. "Season of Birth and Later Outcomes: Old Questions, New Answers." *The Review of Economics and Statistics* 95 (3): 711–724. https://doi.org/10.1162/REST_a_00314.

Chetty, Raj. 2006. "A New Method of Estimating Risk Aversion." *American Economic Review* 96 (5): 1821–1834. https://doi.org/10.1257/aer.96.5.1821.

———. 2012. "Bounds on Elasticities With Optimization Frictions: A Synthesis of Micro and Macro Evidence on Labor Supply." *Econometrica* 80 (3): 969–1018. https://doi.org/10.3982/ECTA9043.

References

Corinth, Kevin, Bruce Meyer, Matthew Stadnicki, and Derek Wu. 2022. "The Anti-Poverty, Targeting, and Labor Supply Effects of Replacing a Child Tax Credit with a Child Allowance." *NBER Working Paper,* no. 29366, https://doi.org/10.3386/w29366.

Dahl, Gordon B., and Lance Lochner. 2012. "The Impact of Family Income on Child Achievement: Evidence from the Earned Income Tax Credit." *American Economic Review* 102 (5): 1927–56. https://doi.org/10.1257/aer.102.5.1927.

Dickert-Conlin, Stacy, and Amitabh Chandra. 1999. "Taxes and the Timing of Births." *Journal of Political Economy* 107 (1): 161. https://doi.org/10.1086/250054.

Eissa, Nada, Henrik Jacobsen Kleven, and Claus Thustrup Kreiner. 2008. "Evaluation of Four Tax Reforms in the United States: Labor Supply and Welfare Effects for Single Mothers." *Journal of Public Economics* 92:795–816. https://doi.org/10.1016/j.jpubeco.2007.08.005.

Feenberg, Daniel, and Elisabeth Coutts. 1993. "An Introduction to the TAXSIM Model." *Journal of Policy Analysis and Management* 12 (1): 189–194. https://doi.org/10.2307/3325474.

References

Feldman, Naomi E., Peter Katuščák, and Laura Kawano. 2016. "Taxpayer Confusion: Evidence from the Child Tax Credit." *American Economic Review* 106 (3): 807–835. https://doi.org/10.1257/aer.20131189.

Gans, Joshua S., and Andrew Leigh. 2009. "Born on the First of July: An (Un)Natural Experiment in Birth Timing." *Journal of Public Economics* 93 (1-2): 246–263. https://doi.org/10.1016/j.jpubeco.2008.07.004.

Goldin, Jacob, Elaine Maag, and Katherine Michelmore. 2022. "Estimating the Net Fiscal Cost of a Child Tax Credit Expansion." *Tax Policy and the Economy* 36:159–195. https://doi.org/10.1086/718953.

Grembi, Veronica, Tommaso Nannicini, and Ugo Troiano. 2016. "Do Fiscal Rules Matter?" *American Economic Journal: Applied Economics* 8 (3): 1–30. https://doi.org/10.1257/app.20150076.

Hoynes, Hilary Williamson, Douglas L. Miller, and David Simon. 2015. "Income, the Earned Income Tax Credit, and Infant Health." *American Economic Journal: Economic Policy* 7 (1): 172–211. https://doi.org/10.1257/pol.20120179.

Hoynes, Hilary Williamson, and Jesse Rothstein. 2016. "Tax Policy Toward Low-Income Families." *NBER Working Paper,* no. 22080, https://doi.org/10.3386/w22080.

References

Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. 2009. "The Response of Consumer Spending to Rebates During an Expansion: Evidence from the 2003 Child Tax Credit." Working Paper. http://finance.wharton.upenn.edu/%7B~%7Dsouleles/research/papers/JPSChildTaxCreditApril2009.pdf.

Kleven, Henrik Jacobsen. 2021. "The EITC and the Extensive Margin: A Reappraisal." *NBER Working Paper,* no. 26405, https://doi.org/10.3386/W26405.

LaLumia, Sara, James M. Sallee, and Nicholas Turner. 2015. "New Evidence on Taxes and the Timing of Birth." *American Economic Journal: Economic Policy* 7 (2): 258–293. https://doi.org/10.1257/pol.20130243.

Looney, Adam, and Monica Singhal. 2006. "The Effect of Anticipated Tax Changes on Intertemporal Labor Supply and the Realization of Taxable Income." *NBER Working Paper,* no. 12417, https://doi.org/10.3386/w12417.

Macurdy, Thomas E. 1981. "An Empirical Model of Labor Supply in a Life-Cycle Setting." *Journal of Political Economy* 89 (6): 1059–1085. https://doi.org/10.1086/261023.

References

Meyer, Bruce D, and Dan T Rosenbaum. 2001. "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers." *The Quarterly Journal of Economics* 116 (3): 1063–1114. https://doi.org/10.1162/00335530152466313.

Nichols, Austin, Elaine Sorensen, and Kye Lippold. 2012. *The New York Noncustodial Parent EITC: Its Impact on Child Support Payments and Employment.* Washington, DC: The Urban Institute. http://www.urban.org/research/publication/new-york-noncustodial-parent-eitc-its-impact-child-support-payments-and-employment.

Saez, Emmanuel, and Gabriel Zucman. 2016. "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data." *Quarterly Journal of Economics* 131 (2): 519–578. https://doi.org/10.1093/qje/qjw004.

Schulkind, Lisa, and Teny Maghakian Shapiro. 2014. "What a Difference a Day Makes: Quantifying the Effects of Birth Timing Manipulation on Infant Health." *Journal of Health Economics* 33 (1): 139–158. https://doi.org/10.1016/j.jhealeco.2013.11.003.

Urban Institute. 2019. *TRIM3 Project Website.* http://trim3.urban.org.

References

Wingender, Philippe, and Sara LaLumia. 2017. "Income Effects on Maternal Labor Supply: Evidence from Child-Related Tax Benefits." *National Tax Journal* 70 (1): 11–52. https://doi.org/10.17310/ntj.2017.1.01.

Robustness Checks

- Alternative specifications: Link
- No demographic differences: Link
- Smooth density: Link
- Varying age window: Link
- Different local polynomial methods: Link
- Placebo tests: Link

Alternate Specifications

	Parent Employed				Parent in Labor Force		
	(1) Base	(2) Single Low Educ.	(3) Leave School $\neq 17$	(4) LFP Measure	(5) Base	(6) Single Low Educ.	(7) Leave School $\neq 17$
Diff in Disc.	-0.084**	-0.055	-0.091*	-0.075*	-0.096**	-0.041	-0.107**
	(0.042)	(0.040)	(0.047)	(0.042)	(0.039)	(0.035)	(0.044)
Age 16.5+	0.076**	0.072**	0.069*	0.057	0.076**	0.047*	0.062*
	(0.035)	(0.031)	(0.038)	(0.036)	(0.032)	(0.027)	(0.036)
Dec. Disc.	0.026	0.008	0.034	0.025	0.042**	0.008	0.050**
	(0.021)	(0.020)	(0.023)	(0.020)	(0.019)	(0.019)	(0.021)
Lagged DV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,443	6,420	7,659	9,443	9,443	6,420	7,659
Clusters	1,034	943	963	1,034	1,034	943	963

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

Back

Demographics (Parents)

	(1) Educ (Coll+)	(2) Race (Non-White)	(3) Married	(4) Age (max)	(5) Num Dep.	(6) Lag Emp.	(7) Lag LFP	(8) Index
Diff in Disc.	-0.041	-0.087	0.042	-0.723	-0.153	-0.016	-0.023	-0.071
	(0.048)	(0.055)	(0.050)	(0.970)	(0.152)	(0.056)	(0.053)	(0.132)
Age 16.5+	0.042	0.054	-0.077*	2.062**	-0.174	0.035	0.028	0.064
	(0.044)	(0.046)	(0.042)	(0.803)	(0.130)	(0.045)	(0.043)	(0.123)
Dec. Disc.	-0.016	0.039	-0.024	0.834	-0.034	-0.042	-0.013	-0.137*
	(0.023)	(0.038)	(0.034)	(0.692)	(0.109)	(0.036)	(0.033)	(0.072)
N	9,443	9,443	9,443	9,443	9,443	9,443	9,443	9,443
Clusters	1,034	1,034	1,034	1,034	1,034	1,034	1,034	1,034
Mean DV	0.08	0.61	0.27	44.27	2.55	0.61	0.72	0.41
χ^2 *p*-value								0.32

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Index refers to standardized index of all other columns. χ^2 *p*-value is for test of first 7 columns being jointly different from zero in seemingly unrelated regression.

Back

Demographics (Children)

	(1) Enrolled in School	(2) Highest Grade Completed	(3) Attrition	(4) Future Months Obs.
Diff in Disc.	0.026	-0.015	-0.004	-0.210
	(0.024)	(0.110)	(0.050)	(0.589)
Age 16.5+ (Post)	-0.041**	0.805***	0.015	0.220
	(0.018)	(0.091)	(0.038)	(0.456)
December Disc.	-0.022	-0.086	-0.008	-0.155
	(0.017)	(0.089)	(0.025)	(0.307)
N	4,691	4,686	7,167	7,167
Clusters	938	937	997	997
Mean DV	0.96	9.56	0.13	8.80

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. (Except columns 1 and 2 are estimated in window of 15.5 to 17.5 year old children).

Back

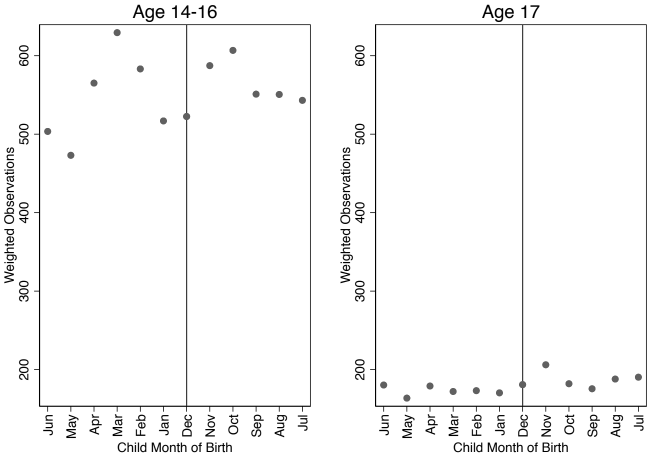
Receipt of Income

	(1) Dividends	(2) Property	(3) Pensions	(4) Soc. Sec.	(5) Transfers	(6) UI
Diff in Disc.	-0.001	0.005	-0.006	-0.031	0.015	-0.001
	(0.011)	(0.010)	(0.017)	(0.029)	(0.032)	(0.022)
Age 16.5+	-0.000	-0.004	0.001	0.005	0.011	-0.012
	(0.010)	(0.009)	(0.014)	(0.023)	(0.023)	(0.016)
Dec. Disc.	-0.010	-0.005	-0.000	0.033**	-0.018	0.006
	(0.007)	(0.005)	(0.008)	(0.014)	(0.017)	(0.011)
Lagged DV	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	9,443	9,443	9,443	9,443	9,443	9,443
Clusters	1,034	1,034	1,034	1,034	1,034	1,034

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

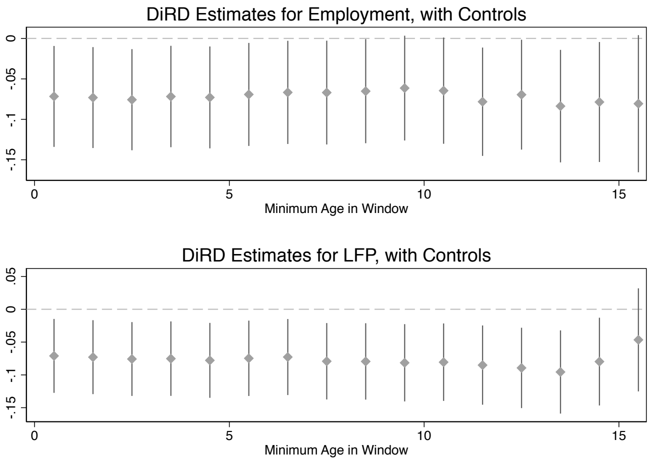
Back

Density Test



Notes: Each point in the figures represents the weighted sum of observations by month of birth for children around each age cutoff. Back

Varying Pre-Period Age Window



Notes: Estimated with local linear regressions, uniform kernels, 6-month bandwidths, on residuals of control variables. Shaded areas are 90 percent confidence intervals. Back

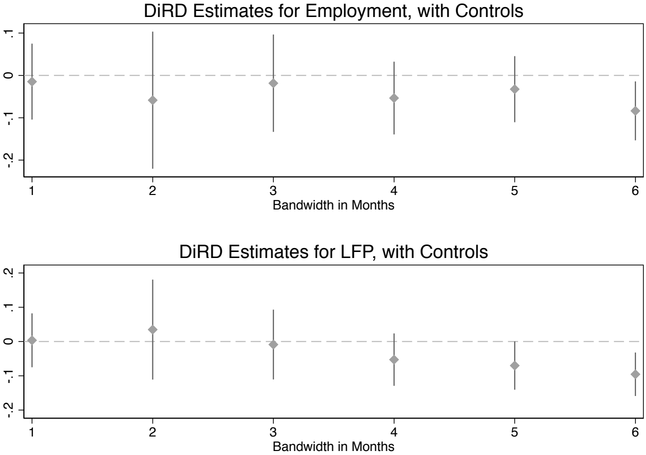
Varying Calculation Method

	Employment				LFP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diff in Disc.	-0.084**	-0.049	-0.007	-0.037	-0.096**	-0.062	-0.009	-0.050**
	(0.042)	(0.048)	(0.075)	(0.026)	(0.039)	(0.043)	(0.066)	(0.025)
Age 16.5+ (Post)	0.076**	0.073*	0.064	0.043**	0.076**	0.063*	0.032	0.052***
	(0.035)	(0.041)	(0.071)	(0.020)	(0.032)	(0.037)	(0.062)	(0.018)
December Disc.	0.026	0.022	0.023	0.009	0.042**	0.035*	0.024	0.018
	(0.021)	(0.023)	(0.034)	(0.014)	(0.019)	(0.021)	(0.031)	(0.012)
Lagged DV	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,443	9,443	9,443	4,840	9,443	9,443	9,443	4,840
Clusters	1,034	1,034	1,034	899	1,034	1,034	1,034	899
Degree	1	1	2	0	1	1	2	0
Kernel	Uni	Tri	Uni	Uni	Uni	Tri	Uni	Uni
Bandwidth	6	6	6	3	6	6	6	3

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Results are estimated for varying degree local linear regresions with uniform or triangular kernels. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

Back

Sensitivity to Bandwidth



Notes: Estimated with local linear regressions, uniform kernels, varying bandwidths, on residuals of control variables. Shaded areas are 90 percent confidence intervals. Back

Placebo DiRD for Period Before CTC was Refundable

	1984-1999				1990-1999			
	(1) Emp.	(2) Emp.	(3) LFP	(4) LFP	(5) Emp.	(6) Emp.	(7) LFP	(8) LFP
Diff in Disc.	0.074	0.044	-0.011	0.010	0.075	0.044	-0.011	0.010
	(0.086)	(0.065)	(0.078)	(0.063)	(0.086)	(0.065)	(0.079)	(0.063)
Age 16.5+	-0.069	-0.092*	-0.001	-0.043	-0.069	-0.092*	-0.001	-0.043
	(0.066)	(0.053)	(0.064)	(0.053)	(0.066)	(0.053)	(0.064)	(0.053)
Dec. Disc.	-0.053	-0.043	-0.005	-0.012	-0.053	-0.043	-0.005	-0.012
	(0.061)	(0.031)	(0.058)	(0.030)	(0.061)	(0.031)	(0.058)	(0.030)
Lagged DV		Yes		Yes		Yes		Yes
Controls		Yes		Yes		Yes		Yes
N	7,467	7,466	7,467	7,466	5,830	5,830	5,830	5,830
Clusters	1,396	1,395	1,396	1,395	826	826	826	826

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in window of 13.5 to 17.5 year old children in tax units with prior year AGI below $20,000. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed). Note that full-year data for 2000 is not included in SIPP data. "Emp." is employment, "LFP" is labor force participation.

Back

Placebo Tests Shifting Cutoff to Earlier Ages

	Parent Employed			Parent in Labor Force		
	(1) Age 16	(2) Age 15	(3) Age 14	(4) Age 16	(5) Age 15	(6) Age 14
Diff in Disc.	0.017	0.010	0.044	-0.059*	0.018	0.059*
	(0.039)	(0.040)	(0.039)	(0.033)	(0.037)	(0.034)
Age $\geq$ Cutoff - 0.5 (Post)	-0.017	-0.018	-0.006	0.029	-0.018	-0.043
	(0.030)	(0.031)	(0.031)	(0.024)	(0.028)	(0.028)
December Disc.	0.004	0.011	-0.018	0.050***	0.036*	0.016
	(0.021)	(0.019)	(0.020)	(0.019)	(0.019)	(0.017)
Lagged DV	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
N	9,487	9,562	9,641	9,487	9,562	9,641
Clusters	1,040	1,052	1,045	1,040	1,052	1,045

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors (clustered by variance strata) in parentheses. Discontinuities are estimated with local linear regressions, uniform kernels, in 6-month windows centered around the December age cutoff. Estimated in age windows of 3.5 years to left and 0.5 years to right of placebo cutoff, in primary sample. Controls are year and state fixed effects and parental characteristics (race, education, max age [quadratic], marriage, metro residence, number of dependents, and indicators for current and lagged months observed).

Back

Dynamic Model

- Following Macurdy (1981), adding fixed costs as in Eissa, Kleven, and Kreiner (2008)
- Continuum of households living τ periods maximizes

$$V_t[A_t, \theta_t] = \max_{p_t, A_{t+1}} U[C_t] - Fp_t + \beta E_t[V_{t+1}[A_{t+1}, \theta_{t+1}]]$$

$$\text{s.t. } A_{t+1} = (1 + r_t)(A_t + Y_t - C_t)$$

$$Y_t = N_t + (1 - p_t) G_t + w_t p_t - T[w_t, \nu_t] p_t$$

- Key elements:
  - Abstract from hours of work; extensive margin only
    - Fixed cost F drawn from CDF $\phi\{F\}$ (once at $t = 0$)
    - Creates binary participation decision p_t
  - Can borrow and save assets A_t across periods
    - Could reflect paying down debt in low-income context

Dynamic Model - Definitions

- Parameter definitions:
  - Consumption C_t, discount rate β
  - Exogenous wages w_t and interest rate r_t
  - Income Y_t includes non-labor income N_t, transfer income G_t, and subtracts taxes $T[w_t, \nu_t]$
  - $G = -T[0, N_t, \nu_t]$ is the value of transfers when not working.
  - Average tax rate $a_t = a_t[w_t, G_t, N_t, \nu_t] = \frac{T[w_t, N_t, \nu_t] + G_t}{w_t}$
  - $\theta_t = \{w_t, G_t, N_t, \nu_t, r_t\}$ includes exogenous state variables
- Assumes indivisible labor, additive intertemporal separability of utility, additive separability of fixed costs, complete capital markets (to borrow and save), rational expectations, and unitary household decision-making

Dynamic Model Solution

- Take small deviations around steady state (Taylor expansions)
- Standard Euler equation pins down A^*_{t+1} in each participation state
  - Solve problem of dependence of optimal savings on past and future work decisions by setting savings as linear function of marginal propensity to save α:

$$\Delta A^*_{t+1} = \alpha \Delta Y_t$$

- Work decision in each period based on cutoff condition

$$\Delta V^* = \Delta U + \beta E_t \left[\Delta V_{t+1}\right] \geq F$$

  - Probability of participation is $P_t = E\left[p_t\right] = \phi\left[\Delta V^*\right]$

Dynamic Model Solution, Cont.

- Simplify with Taylor expansion (to second order) to find

$$\begin{aligned}\varepsilon_I &= \frac{\partial P_t}{\partial\left(1-a_t\right)}\cdot\frac{1-a_t}{P_t}\\ &\approx \frac{\phi'\left[\Delta V^*\right]}{\phi\left[\Delta V^*\right]}\lambda^0 w_t\left(1-a_t\right)\\ &* \left(1+\frac{\lambda_c^0}{\lambda^0}w_t\left(1-a_t\right)\left(1-\frac{2\alpha}{1+r_t}+\frac{\left(2+r_t\right)\alpha^2}{\left(1+r_t\right)^2}\right)\right)\end{aligned}$$

- Solve in case with $\alpha = 0$ (steady state) and take ratio, then cancel terms and substitute, to get:

$$\varepsilon_I \approx \left(\frac{1-\frac{\gamma W_t}{1-s_t}\left(1-\frac{2\alpha}{1+r_t}+\frac{(2+r_t)\alpha^2}{(1+r_t)^2}\right)}{1-\frac{\gamma W_t}{1-s_t}}\right)\epsilon_S$$

Calibration

To calibrate the model, I set:

- $\gamma = 1$ (following Chetty (2006))
- $\alpha = 0.75$ (following Johnson, Parker, and Souleles (2009), who find $\mu = 0.25$ in a study based on a response to the Child Tax Credit)
- $r_t = 0.073$, $s_t = -0.02$ (using Saez and Zucman (2016))
- $W_t = 0.80$ for employment and $W_t = 0.41$ for labor force participation
  - computed based on the mean changes in post-tax income when working in my sample, computed for the prior year

Back