8-4-2020

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Upjohn Institute working paper ; 20-331

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August 2020

ABSTRACT

The Child and Dependent Care Credit (CDCC), a tax credit based on taxpayers' income and child care expenses, reduces families' child care costs. The nonrefundable federal CDCC is available to working families with children younger than 13 years old in all states, and nearly half of states supplement the federal credit with their own child care credits. The Economic Growth and Tax Relief Reconciliation Act expanded the federal CDCC in 2003, which led to differential increases in CDCC generosity across states and family sizes. I document CDCC eligibility and expenditures over time and across income and demographic groups. Using data from the March Current Population Survey, I find that a 10 percent increase in CDCC benefits increases annual paid child care participation by 4–5 percent among households with children younger than 13 years old. I also find that CDCC benefits increase labor supply among married mothers. Increases in labor supply among married mothers with very young children suggest that CDCC benefits may generate long-run earnings gains.

JEL Classification Codes: J13, H24, J22, H71

Key Words: Child care subsidies, female labor supply, instrumental variables; participation

Acknowledgments: I thank Mike Conlin, Stacy Dickert-Conlin, Steven Haider, Scott Imberman, Cristian Meghea, an anonymous referee, and seminar participants at Abt Associates, Grand Valley State University, Michigan State University, the EALE/SOLE/AASLE World Conference, the U.S. Bureau of Labor Statistics, and the W.E. Upjohn Institute for Employment Research for helpful comments and suggestions. The views expressed in this paper are my own and do not necessarily reflect those of the W.E. Upjohn Institute for Employment Research.

1 Introduction

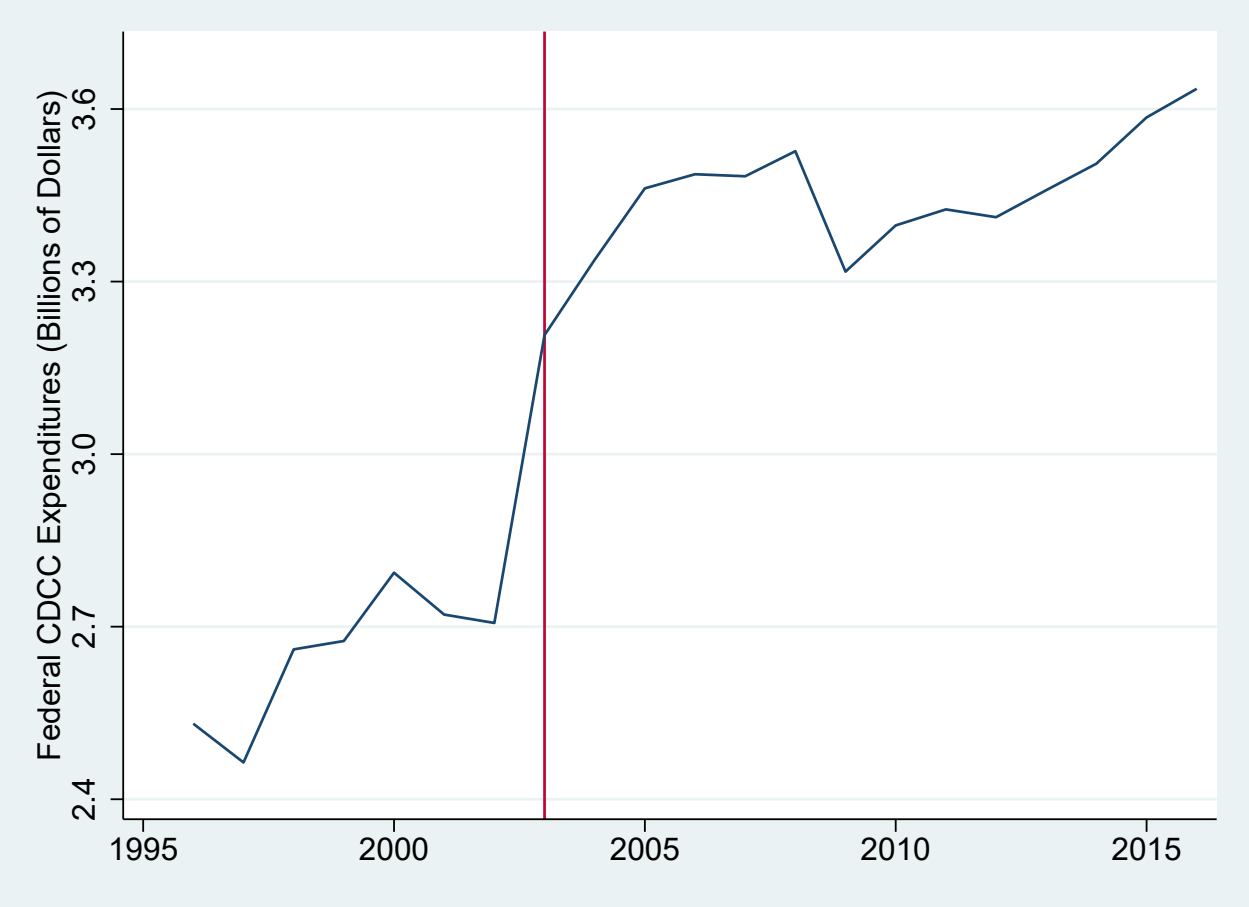
Child care in the United States is expensive. According to a 2018 Care.com survey of around 1,300 U.S. parents, 33 percent of families spent at least 20 percent of their incomes on child care (Care.com 2018).[1] Child care costs matter because high costs may induce parents to exit the labor market or to place their children in lower-quality child care arrangements (Kuziemko et al. 2018). Existing research shows that substitution into higher-quality child care arrangements accelerates children's human capital development (Cornelissen et al. 2018; Cunha and Heckman 2007; Havnes and Mogstad 2011) and that parents who remain in the labor market may experience long-run earnings gains (Angelov, Johansson, and Lindahl 2016; Kleven et al. 2019; Kleven, Landais, and Søgaard 2019). In light of this, many policymakers have advocated for measures to decrease child care costs within the United States.

Currently, the Child and Dependent Care Credit (CDCC) subsidizes child care costs for working families. The CDCC, a tax credit based on taxpayers' income and child care expenses, is "designed to help families pay employment-related expenses for care of a child" (Gitterman and Howard 2003, p. 19). The nonrefundable federal CDCC is available in all states to working families with children younger than 13 years old, and nearly half of states supplement the federal credit with their own refundable or nonrefundable state child care credits. In this paper, I use variation in CDCC generosity over time and across states and family sizes to estimate the effects of child care subsidies on family outcomes.

Figure 1 shows that the Economic Growth and Tax Relief Reconciliation Act, which was a part of the Bush tax cuts, expanded the federal CDCC in 2003 and led to large increases in federal CDCC expenditures. These expenditures increased from $2.7 billion in 2002 to $3.2 billion in 2003 and continued to increase to over $3.6 billion by 2016. The 2003 expansion increased CDCC benefits differentially across states and family sizes because states calculate their CDCC benefits as a percent of federal CDCC benefits. Additionally, taxpayers with two or more children were eligible for larger benefit amounts than taxpayers with only one child.

[1] Survey respondents were recruited via the Care.com website.

Figure 1: Federal CDCC Expenditures over Time



NOTE: Federal CDCC expenditures over time in nominal dollars.
SOURCE: Information was retrieved from IRS Statistics of Income.

In this paper, I first document CDCC eligibility and expenditures over time and across income and demographic groups. When accounting for the nonrefundability of the federal and some state CDCCs, I find that 21 percent of single mothers, 22 percent of single fathers, and 21 percent of married households qualify for CDCC benefits. I also find that the majority of federal CDCC expenditures are allocated toward low- and middle-income taxpayers, who qualify for the largest benefit amounts. All else equal, an additional 4 percent of single mothers, 2 percent of single fathers, and 2 percent of married households would qualify for benefits if the federal CDCC was made refundable.

I then turn to estimating the effects of CDCC benefits on paid child care participation and labor market outcomes. Because CDCC benefits likely are correlated with unobservable characteristics

of taxpayers that affect both CDCC benefits and outcomes, as well as behavioral responses to changes in the tax code, I use increases in CDCC generosity from the Bush tax cuts to create an instrument for CDCC benefits. I estimate that a 10 percent increase in CDCC benefits increases annual paid child care participation in that same tax year by 4 to 5 percent among households with children younger than 13 years old. I also find that CDCC benefits increase labor supply among married women with children younger than 13 years old. Increases in labor supply among married mothers with very young children suggest that CDCC benefits may generate long-run earnings gains.

My work contributes to the literature on the CDCC and policies to increase parents' access to child care and labor supply more broadly. Only three papers have studied the CDCC directly since its expansion in 2003.[2] Rodgers (2018) estimates the tax incidence of the CDCC and finds that over half of every CDCC dollar is passed through in the form of higher child care prices and child care provider wages. Miller and Mumford (2015) use the federal CDCC expansion and data from the Consumer Expenditure Survey to estimate large elasticities of child care expenditures with respect to CDCC benefits. I augment their work by accounting for cross-state changes in CDCC generosity and allowing for fixed effects across states. Finally, Guner, Kaygusuz, and Ventura (forthcoming) estimate the effects of transfer programs for families, including the CDCC, using life-cycle models of fertility, labor supply, and child care. They find that expanding the CDCC would increase labor force participation among married women. Estimates from my models further their work, as I account for state CDCC programs, and I do not rely on assumptions about parents' labor efficiency.

While there is extensive work on the effects of child care subsidies in Europe and Canada,[3] including evidence that child care subsidies increase paid child care participation (Baker, Gruber, and Milligan 2008; Givord and Marbot 2015), there is limited research on the effects of child care subsidies within the United States.[4] Effects of child care subsidies likely differ across countries because of differences in policy contexts. For instance, child care subsidies in Europe and Canada tend to be much more generous than the CDCC. If fixed costs of paid child care use prevent partic-

[2]See Averett, Peters, and Waldman (1997) and Michalopoulos, Robins, and Garfinkel (1992) for earlier literature on the CDCC.

[3]See Baker, Gruber, and Milligan (2008), Bettendorf, Jongen, and Muller (2015), Cornelissen et al. (2018), Givord and Marbot (2015), Havnes and Mogstad (2011), Lefebvre and Merrigan (2008), Lefebvre, Merrigan, and Verstraete (2009), and Lundin, Mörk, and Öckert (2008).

[4]Tekin (2005, 2007) estimates the effects of child care subsidies for very-low-income parents through the Aid to Families with Dependent Children and Temporary Assistance for Needy Families (TANF) programs.

ipation within the United States, then responses to increased CDCC generosity may be relatively small, especially among low-income parents who do not benefit from the nonrefundable federal credit. Additionally, existing evidence suggests that labor supply responses to child care subsidies largely depend on female labor supply at baseline, which varies drastically across countries. For example, Baker, Gruber, and Milligan (2008) and Lefebvre and Merrigan (2008) study the introduction of highly subsidized child care in Quebec in 1997, where the labor force participation rate among mothers of young children was only 53 percent at baseline. They find that women increase their labor supply by 13 to 14.5 percent in response to the policy. In contrast, Bettendorf, Jongen, and Muller (2015) and Givord and Marbot (2015) study increases in child care subsidies in the Netherlands in 2005 and France in 2004, respectively, where labor force participation rates among mothers of young children were nearly 70 percent or higher. They find that mothers increased their labor supply by only 1 to 3 percent in response to the reforms.

Studies of universal kindergarten and prekindergarten provide some of the most credible evidence on mothers' labor supply responses to effective decreases in the cost of child care within the United States. Existing work finds large positive effects of universal schooling among mothers without additional younger children (Cascio 2009; Fitzpatrick 2010; Gelbach 2002). Still, effects of universal schooling may differ from those of child care subsidies like the CDCC for several reasons. For example, universal schooling is fully subsidized by the government and in some cases mandatory, whereas taxpayers' CDCC benefits are functions of their labor supply, income, and child care expenditures. Additionally, taxpayers generally face a much larger set of choices over child care providers than schools.

In the following section, I describe the data. In Section 3, I provide institutional details about the CDCC and document eligibility and expenditures over time and across the income distribution. In Section 4, I present a conceptual framework of CDCC incentives. In Sections 5 and 6, I study CDCC benefits and paid child care participation and labor supply, respectively. In Section 7, I conclude.

2 Data

I use the 2001-–2009 March Current Population Survey (CPS) to study CDCC benefits, paid child care participation, and labor market outcomes (Roth 2019).[5] The March CPS is an annual state-representative survey of nearly 100,000 households. The data document individuals' demographics and labor market outcomes. In particular, it documents individuals' employment, hours worked per week, and income from various sources during the previous calendar year. The main advantages of the March CPS are its large sample size and detailed information on labor market outcomes. Unfortunately, the March CPS does not contain extensive data on child care choices; I only observe whether households report using paid child care services on an annual basis.

To isolate the population most affected by child care subsidies, I limit the sample to parents aged 26–54 in households with children younger than 13 years old in the main analyses.[6] There are over 300,000 parents in this sample. Table 1 displays pre-CDCC expansion summary statistics from the 2001-–2003 surveys by sex and marital status. Preexpansion parents are 36–38 years old on average. Across all demographic groups, parents average about two children. Some 25 percent of single parents and 23 percent of married parents pay for child care, which suggests that CDCC benefits may affect a large proportion of the sample. Education levels and labor market outcomes differ considerably by sex and marital status. While 35 percent of married parents have college degrees, only 15 percent of single mothers and 12 percent of single fathers are college educated. And despite relatively high education levels, married mothers exhibit relatively low levels of labor force attachment. Some 71 percent of married mothers worked for pay during the previous calendar year, working 25 hours per week and earning $20,657 (2000 dollars) per year on average. Married fathers are the most attached to the labor force, with a 96 percent employment rate and average annual earnings of $57,875 per year. Single mothers have slightly lower labor force attachment than single fathers; 82 percent of single mothers and 88 percent of single fathers are employed. Average annual earnings are $21,497 among single mothers and $31,340 among single fathers.

[5] Information on paid child care participation was first elicited in the 2001 survey.

[6] I drop parents who report receipt of child care subsidies through the TANF program. This decreases the sample size by 1 percent. Results are robust to including these parents in the sample.

Table 1: Summary Statistics

	Single mothers	Single fathers	Married mothers	Married fathers
Age	35.73	36.59	36.39	38.04
	(0.08)	(0.16)	(0.04)	(0.04)
White	0.64	0.78	0.85	0.86
	(0.01)	(0.01)	(0.00)	(0.00)
Black	0.31	0.17	0.08	0.08
	(0.01)	(0.01)	(0.00)	(0.00)
College	0.15	0.12	0.35	0.35
	(0.00)	(0.01)	(0.00)	(0.00)
Kids <6	0.52	0.62	0.75	0.76
	(0.01)	(0.02)	(0.00)	(0.00)
Kids <17	1.96	1.87	2.07	2.06
	(0.01)	(0.02)	(0.01)	(0.01)
Child care	0.25	0.25	0.23	0.23
	(0.01)	(0.01)	(0.00)	(0.00)
Employed	0.82	0.88	0.71	0.96
	(0.00)	(0.01)	(0.00)	(0.00)
Hours	31.73	37.35	25.01	43.70
	(0.20)	(0.35)	(0.11)	(0.08)
Earnings	21,497	31,340	20,657	57,875
	(307)	(896)	(181)	(381)
Observations	10,400	2,865	38,224	39,278
representative of	14,095,944	3,680,332	49,015,828	50,476,768

NOTE: Summary statistics for parents aged 26-54 in households with children younger than 13 years old. "Child care" indicates whether the household paid for child care, "Employed" indicates whether the individual was employed, and "Hours" indicates the usual number of hours that the individual worked per week during the previous calendar year. Earnings also are from the previous calendar year. Standard deviations are listed in parentheses.
SOURCE: Data were retrieved from the 2001–2003 March CPS using household weights.

Because I do not observe expenditures in the March CPS data, I also use data from the Survey of Income and Program Participation (SIPP) Child Care Topical Module that was administered in 2002 (U.S. Census Bureau 2019). The SIPP is a nationally representative survey of over 40,000 households; the Child Care Topical Module documents individuals' demographics and child care expenditures. Table 2 displays average child care expenditures from the SIPP, conditional on paid child care participation, by marital status, number of children, the presence of a child younger than age 6 in the household, and whether the mother or single father has a college degree. There are 1,320 households in the sample, and child care expenditures vary considerably across demographic

groups. Annual child care expenditures range from less than $2,000 among married households with only one child younger than 13 years old and no children younger than 6 years old in which the mother does not have a college degree to over $9,000 among college-educated single parents with two or more children younger than age 13 and at least one child younger than age 6. Nearly all demographic groups spend over $3,000 per year on child care, conditional on participation, and expenditures tend to increase with educational attainment, number of children, and the presence of young children in the household.

Table 2: Average Annual Child Care Expenditures in 2002 among SIPP Respondents by Demographic Group, Conditional on Paid Child Care Participation

	Single, 1 child	Single, 2+ children	Married, 1 child	Married, 2+ children
No child <6, no college	$2,308	$3,966	$1,792	$3,544
No child <6, college	$2,809	$5,201	$3,485	$4,530
Child <6, no college	$4,131	$4,690	$4,707	$5,534
Child <6, college	$5,005	$9,353	$6,459	$8,301

NOTE: Average annual child care expenditures by marital status, number of children younger than 13 years old, the presence of at least one child younger than 6 years old, and an indicator for the mother's (or single father's) education, conditional on paid child care participation.
SOURCE: Data were retrieved from the 2002 SIPP Child Care Topical Module using household weights.

I also use data from the IRS Statistics of Income (SOI) tables (Internal Revenue Service 2019), which document federal CDCC expenditures by adjusted gross income (AGI) categories, such as $0 to $15,000 in AGI, $15,000 to $25,000 in AGI, and so forth. Finally, I use the National Bureau of Economics Research's TAXSIM Program throughout the analyses (Feenberg 2017). TAXSIM calculates individuals' tax liabilities, marginal tax rates, and tax credits, including their federal and state CDCC benefits.

3 Institutional Details and CDCC Eligibility and Expenditures

3.1 Background

Congress implemented the CDCC in 1976. At that time, as shown in Table 3, taxpayers could receive up to $400 per calendar year in CDCC benefits per child younger than age 13 for up to two children. More specifically, taxpayers could claim up to $2,000 of child care expenditures per child and would receive a nonrefundable credit worth 20 percent of those expenses. All CDCC claimants had to be working to qualify for benefits, including both spouses among taxpayers married filing jointly, although benefits generally did not depend on filing status.[7] Additionally, if either spouse's earnings were less than child care expenditures, then the CDCC was calculated as a percent of the lesser of the two taxpayers' earnings. Eligible child care expenditures included spending on child care provided by anyone but the taxpayer's spouse or dependent or the child's parent.[8] To claim the credit, taxpayers had to list their earnings, child care expenditures, and child care providers' tax identification or Social Security numbers on federal Form 2441. Benefits decreased taxes due during the following calendar year.

[7] Taxpayers married filing separately are ineligible for CDCC benefits.

[8] In particular, taxpayers may receive CDCC benefits for child care provided by the child's grandparents or other relatives.

Table 3: Federal CDCC Parameters over Time

	1976	1982	2003
Max number of children	2	2	2
Max qualifying expenses per child	$2,000	$2,400	$3,000
Max benefit rate	0.20	0.30	0.35
Max CDCC per child	$400	$720	$1,050
Start of phase-out	N/A	$10,000	$15,000
End of phase-out	N/A	$28,000	$43,000
Max CDCC per child after phase-out	$400	$480	$600
Refundable?	No	No	No

NOTE: Federal CDCC parameters over time in nominal dollars. "Max number of children" indicates the maximum number of children younger than 13 years old for which taxpayers could receive CDCC benefits. "Start of phase-out" and "End of phase-out" indicate the AGI levels at which benefits begin to decrease and remain constant, respectively.
SOURCE: Information was retrieved from federal tax forms.

In 1981, Congress increased the limit on qualifying child care expenditures and the benefit rates by which those expenditures were multiplied to calculate CDCC benefits. Nevertheless, the CDCC was not indexed to inflation, and because there were no legislative changes to the credit between 1981 and 2001, its real value decreased substantially. Then, in 2001, as part of the Bush tax cuts, a broad set of initiatives to lower taxes on the middle class, Congress increased the CDCC expense limit and rate schedule. These changes took effect in 2003. Table 3 shows that beginning in 2003, taxpayers could claim up to $3,000 in child care expenses per child for up to two children and receive a nonrefundable tax credit worth up to 35 percent of those expenses, or $1,050. The benefit rate decreased by 1 percentage point for each additional $2,000 in AGI above $15,000 until it remained at 20 percent for those with $43,000 or more in AGI, who could receive up to $600 in federal CDCC benefits.

3.2 Who Benefits from the CDCC?

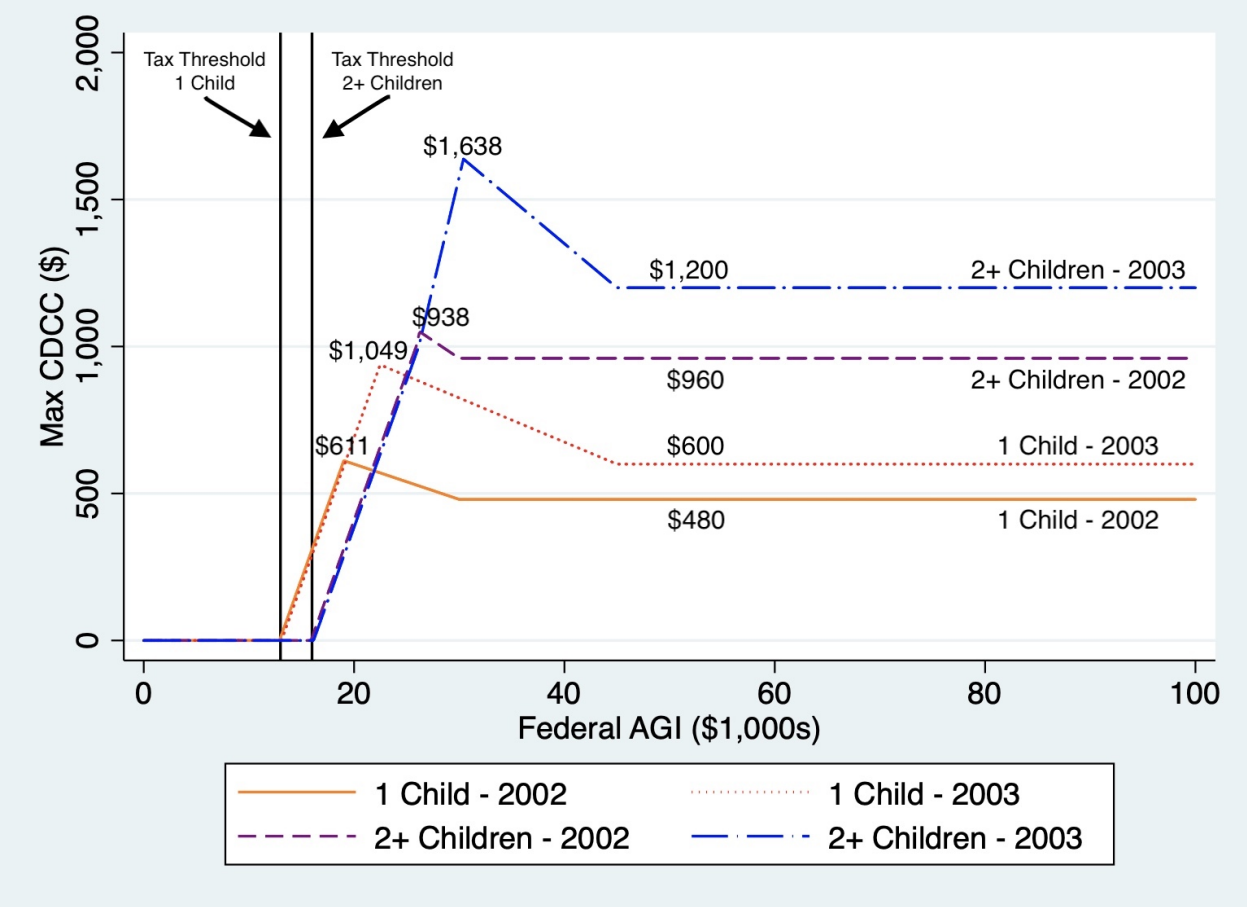
Both before and after the federal CDCC expansion in 2003, the nonrefundability of the federal CDCC generated a difference between statutory and effective, or actual, CDCC benefits received. I therefore use tax filing thresholds, AGI levels at which taxpayers begin to have positive tax liability, to graph effective federal CDCC benefit schedules for taxpayers with the maximum child

care expenditures before and after the federal CDCC expansion in Figure 2.[9] The solid orange line graphs the effective tax schedule for taxpayers with one child younger than 13 years old as of 2002, the dashed purple line the schedule for taxpayers with two or more children as of 2002, the dotted red line the schedule for taxpayers with one child as of 2003, and the dash-dotted blue line the schedule for taxpayers with two or more children as of 2003. As expected, the nonrefundability of the federal CDCC implies that taxpayers with incomes below the tax filing thresholds are ineligible for CDCC benefits. Taxpayers with one child and two or more children must have incomes around $13,000 and $16,000 or more, respectively, to be eligible for CDCC benefits both before and after the federal expansion. In 2002, effective CDCC benefits increase with income for taxpayers with one child before reaching a peak of about $600 for taxpayers with approximately $19,000 in income. This is well below the statutory maximum of $720 shown in Table 3. Effective benefits then decrease until they reach $480 for taxpayers with $30,000 in income. After the federal expansion, the effective CDCC phase-in region extends so that benefits reach a peak of about $940 for taxpayers with $22,500 in income. Again, the nonrefundability of the federal CDCC generates a difference between maximum statutory benefits, or $1,050, and maximum effective benefits. Postexpansion effective CDCC benefits also decrease over a larger range of incomes before remaining constant at $600 for taxpayers with $43,000 or more in income. Hence, among taxpayers with one child younger than age 13, the federal CDCC expansion creates longer effective CDCC phase-in and phase-out regions while weakly increasing CDCC generosity at all income levels.[10]

[9] Effective federal CDCC benefit schedules for taxpayers with lower child care expenditure levels are less generous but otherwise similar.

[10] For some income levels, the federal CDCC expansion decreases maximum CDCC benefits by up to $25.

Figure 2: Maximum Effective Federal CDCC Benefits by Federal AGI



NOTE: Maximum effective federal CDCC benefits for households with one or two or more eligible dependents before and after the federal CDCC expansion in 2003 in nominal dollars.
SOURCE: Information was retrieved from federal tax forms.

Taxpayers with two or more children younger than age 13 face more generous but otherwise similar effective CDCC schedules. In 2002, effective CDCC benefits peak at $1,050 for taxpayers with $26,300 in income and remain at $960 for taxpayers with $30,000 or more in income. Similarly to the pattern for households with one child, effective CDCC benefits are less than statutory benefits. The effective CDCC phase-in and phase-out ranges extend in 2003 so that effective benefits peak at around $1,640 for taxpayers with $30,400 in income and remain constant at $1,200 for taxpayers with $43,000 or more in income.

In addition, as of 2002, taxpayers in 21 states and the District of Columbia (DC) could receive additional CDCC benefits through state supplements to the federal credit. The column "Statutory max" of Table 4 lists statutory maximum state CDCC benefits for taxpayers with two or more chil-

dren as of 2002. Statutory maximum benefits vary considerably across states, ranging from $288 in Arkansas and Kentucky to $1,920 in Oregon. Table 4 also shows that in the nine states (and DC) that offer refundable CDCCs, statutory maximum state CDCC benefits equal effective maximum benefits, which are listed in the column "Effective max." In states without refundable CDCCs, statutory maximum CDCC benefits exceed effective maximum benefits, as with the federal credit. In addition to refundability, eight of the states in Table 4 make their CDCCs progressive by limiting benefits to taxpayers with AGI below a certain threshold.

Table 4: Characteristics of State CDCC Programs as of 2002

State	Statutory max	Effective max	Refundable?	AGI limit	Provision
AR	$288	$237	No	N/A	20% of federal CDCC
CA	$907	$907	Yes	$100,000	63% of federal CDCC
CO	$720	$596	No	$60,000	50% of federal CDCC
DE	$720	$596	No	N/A	50% of federal CDCC
DC	$461	$461	Yes	N/A	32% of federal CDCC
HI	$1,200	$1,200	Yes	N/A	25% of federal CDCC expenditures
IA	$1,080	$1,080	Yes	$40,000	75% of federal CDCC
KS	$360	$298	No	N/A	25% of federal CDCC
KY	$288	$288	Yes	N/A	20% of federal CDCC
ME	$360	$262	No	N/A	25% of federal CDCC
MD	$468	$341	No	$50,000	32.5% of federal CDCC
MN	$1,079	$1,079	No	$32,250	Federal CDCC for which eligible
NE	$1,440	$1,193	No	N/A	100% of federal CDCC
NM	$1,200	$1,200	Yes	$21,424	40% of eligible child care expenditures
NY	$1,584	$1,584	Yes	N/A	110% of federal CDCC
NC	$432	$432	Yes	N/A	9% of federal CDCC expenditures
OH	$1,440	$1,440	Yes	$40,000	100% of federal CDCC
OK	$288	$239	No	N/A	20% of federal CDCC
OR	$1,920	$1,440	No	$45,000	30% of “allowable” federal CDCC expenditures
RI	$360	$262	No	N/A	25% of federal CDCC
SC	$336	$336	Yes	N/A	7% of federal CDCC expenditures
VT	$346	$252	No	N/A	24% of federal CDCC

NOTE: Characteristics of state CDCC programs as of 2002. Columns “Statutory max” and “Effective max” list statutory and effective maximum state CDCC benefits, respectively. “AGI limit” lists the AGI at which the household is no longer eligible for CDCC benefits. “Provision” displays the calculation to determine the state’s statutory CDCC benefits.
SOURCE: Information retrieved from state and federal tax forms.

The federal CDCC expansion increased CDCC generosity differentially across states because states calculate their benefits as a percent of the federal credit or the child care expenses used to calculate it. The "Provision" column in Table 4 lists the calculation used to determine each state's statutory benefits. Seventeen states offer CDCCs that are a percent of the federal CDCC, and 4 states offer CDCCs that are a percent of federal CDCC expenditures. Hence, benefits increased differentially across states due to differences in preexisting credit formulas. For example, Oregon's effective maximum CDCC increased from $1,440 in 2002 to $2,100 in 2003. Meanwhile, maximum effective state benefits increased from $288 to $420 in Kentucky.[11] While changes in state CDCC generosity between 2002 and 2003 generally arose due to heterogeneity in formulas, California and Maine decreased and Vermont increased its CDCC generosity relative to that of the federal credit in 2003. Louisiana also implemented a CDCC program for the first time in 2003. I address the possibility of state policy responses to the federal CDCC expansion in Sections 5 and 6.

Both before and after the federal CDCC expansion, the CDCC has interacted with other elements of the tax code in a complicated way. For instance, for some taxpayers, federal CDCC benefits directly offset benefits from the Child Tax Credit (CTC), a tax credit for families based on number of children. Before 2001, the CTC was a nonrefundable credit worth up to $500 per child.[12] The Bush tax cuts increased the CTC to $600 per child in 2001 and $1,000 per child in 2003 and created the Additional Child Tax Credit (ACTC), a refundable portion of the CTC, in 2001. Because of this, taxpayers without taxable income after deductions could receive ACTC benefits worth up to 10 percent of their AGI above $10,000 beginning in 2001 and up to 15 percent of their AGI over $10,000 beginning in 2004. The CDCC came before the CTC on Federal Form 1040 and, therefore, reduced taxpayers' tax liability. Taxpayers with positive tax liability before claiming CDCC benefits but without positive tax liability after claiming the CDCC became ineligible for the nonrefundable portion of the CTC but remained eligible for the ACTC. Because the ACTC was limited to a percent of AGI over $10,000, however, CDCC benefits decreased CTC benefits for some taxpayers.

[11] As of 2002, Hawaii, Minnesota, and New Mexico had maximum CDCC levels, which limited the amounts by which their maximum CDCCs could increase between 2002 and 2003. Additionally, some states offered larger CDCC benefit rates to lower-income taxpayers, which led to larger increases in CDCC benefits for such households.

[12] The CTC was only worth up to $400 in 1998.

Table 5 illustrates interactions between the CDCC and CTC for hypothetical taxpayers. In particular, Table 5 shows federal taxable income and CDCC and CTC benefits for unmarried taxpayers with two children younger than 13 years old, at least $6,000 in child care expenditures, and different gross income levels as of 2003. I assume that all income comes from earnings and that taxpayers tax-minimize. Taxpayers with only $10,000 in earnings do not have taxable income and do not benefit from the CDCC or CTC. Taxpayers with $25,000, $50,000, and $100,000 in earnings, however, have taxable income and benefit from both the CDCC and CTC. Taxpayers with $25,000 in earnings, for example, receive $885, or 4 percent of their income, in federal CDCC benefits and $1,450 in ACTC benefits. Without claiming the CDCC, however, those taxpayers would have had higher tax liability and received an additional $550 in CTC benefits. Taxpayers with $50,000 and $100,000 in earnings have tax liability sufficiently high to be eligible for only the nonrefundable portion of the CTC, so claiming the CDCC does not affect their CTC benefits.

Table 5: Federal Tax Benefits for Unmarried Taxpayers with Two Children as of 2003

	$10,000	$25,000	$50,000	$100,000
Federal taxable income	$0	$8,850	$33,850	$83,850
Federal CDCC	$0	$885	$1,200	$1,200
CDCC % of Income	0%	4%	2%	1%
Nonrefundable CTC	$0	$0	$2,000	$750
ACTC	$0	$1,450	$0	$0
CTC loss from CDCC	$0	$550	$0	$0
Potential FSA benefits	$750	$750	$1,250	$1,400
Federal EITC	$4,000	$1,831	$0	$0

NOTE: Federal taxable income and benefits for unmarried taxpayers with two children younger than 13 years old and $10,000, $25,000, $50,000, or $100,000 in income, where all income comes from earnings and taxpayers have the maximum qualifying child care expenditures and tax-minimize as of 2003. "CTC Loss from CDCC" indicates the additional CTC benefits that the taxpayer would have received if they had not claimed the CDCC. "Potential FSA benefits" are the maximum dependent care FSA benefits that the taxpayer can receive if their employer offers an FSA.
SOURCE: Author's calculations from federal tax forms.

Additionally, 40 percent of workers can access dependent care flexible spending accounts (FSA) that their employers offer, which interact with CDCC benefits (Bureau of Labor Statistics 2018). Since 1986, employees who receive FSAs from their employers have been able to set aside up to $5,000 of earnings before taxes for dependent care expenses. The employer deducts this in-

come from employees' paychecks, but employees are reimbursed for qualified child care expenses, which, similar to the CDCC, include expenditures on care inside and outside of the home. Unlike the CDCC, however, the decision to set aside funds for an FSA occurs before the employee's child care expenditures are realized.

While taxpayers may receive benefits from both FSAs and the federal CDCC, they may not double count expenses across the two child care subsidy programs. FSAs generally provide larger tax benefits per dollar than the federal CDCC, given the CDCC's nonrefundability and high marginal tax rates among high-income taxpayers. Nevertheless, Table 2 shows that many families spend over $5,000 per year in child care and can therefore benefit from both programs. In addition, low-income families are relatively unlikely to have access to dependent care FSAs, as only about 20 percent of workers with wages in the bottom quartile are offered FSA benefits (Bureau of Labor Statistics 2018). Table 5 shows the maximum FSA benefits that unmarried taxpayers with two children could receive at different income levels as of 2003. Potential FSA benefits increase with income as taxpayers move into higher tax brackets. Specifically, taxpayers with $10,000 or $25,000 in earnings can receive up to $750 in FSA benefits, while taxpayers with $50,000 and $100,000 in earnings can receive up to $1,250 and $1,400 in FSA benefits, respectively.

Furthermore, the CDCC may interact indirectly with the Earned Income Tax Credit (EITC), an earnings subsidy targeted at low- and moderate-income families with children. While EITC benefits are not a function of the CDCC, both the CDCC and EITC promote work for families with children. Specifically, EITC benefits increase with household earnings until they reach a maximum benefit level. Benefits then remain constant until household earnings reach another level at which benefits begin to phase out toward zero. And as with the CDCC, several states have their own EITC programs. Unlike the federal CDCC, however, the federal EITC depends only on household earnings, is fully refundable, and did not change between 2000 and 2008. Researchers show that EITC benefits increase extensive margin labor supply among single mothers (Eissa and Liebman 1996; Hoynes and Patel 2018; Keane and Moffitt 1998; Meyer and Rosenbaum 2001) and decrease extensive margin labor supply among married mothers (Eissa and Hoynes 1998). While intensive margin effects tend to be smaller, Chetty, Friedman, and Saez (2013) use data on all U.S. taxpayers to find intensive-margin earnings elasticities of 0.31 in the phase-in region and 0.14 in the phase-out region of the credit.

While the CDCC and EITC may interact, differences in program targeting likely limit interactions between the two tax credits. For instance, the refundable EITC reaches low-income taxpayers who do not qualify for the CDCC. Table 5 shows that taxpayers with $10,000 in earnings are eligible for $4,000 in federal EITC benefits but $0 in CDCC benefits. High-income taxpayers, in contrast, can qualify for CDCC benefits but are ineligible for the EITC. Table 5 shows that taxpayers with $50,000 and $100,000 in earnings receive $1,200 in CDCC benefits but $0 in federal EITC benefits.[13]

Interactions with other elements of the tax code and differences in benefit rates suggest that there may be heterogeneity in CDCC eligibility and benefits across the income distribution. I am the first to characterize federal CDCC eligibility across income and demographic groups. I use the March CPS data to document eligibility before turning to the IRS SOI data, which shows the proportion of federal CDCC expenditures allocated toward different income groups.

Because I do not observe child care expenditures in the March CPS, I impute expenditures using the SIPP Child Care Topical Module data. For a given CPS respondent who reported that her household did not pay for child care during a given tax year, I impute $0 in child care expenditures. For another CPS respondent who reported that his household did pay for child care, I impute the inflation-adjusted average child care expenditure amount among SIPP respondents who paid for child care in the same demographic group by marital status, number of children, child age, and education level using sample weights.[14]

After imputing demographic groups' expenditure amounts and assigning them to March CPS respondents, I simulate households' CDCC benefits using NBER's TAXSIM program, assuming tax-minimization behavior.[15] Evidence from Jones (2014), who documents that over 77 percent

[13]The Child Care and Development Fund (CCDF) also provides funding to states to administer child care subsidy programs for very-low-income families. These state child care subsidy programs generally target families participating in or transitioning out of the TANF program, serving about 800,000 families as of 2017 (Office of Child Care, Administration for Children and Families, U.S. Department of Health and Human Services 2019). Families that receive child care subsidies through CCDF generally do not benefit from the federal CDCC as their incomes are too low to have positive tax liability after other deductions.

[14]SIPP respondents report child care expenditures during the past month. I multiply monthly expenditures by 12 to compute annual expenditures. In additional analyses, I regress child care expenditures on individual demographic information using the sample of SIPP respondents who paid for child care. I then use the coefficient estimates from these regressions to calculate an imputed child care expenditure amount for each CPS respondent who reported paid child care participation. Results using this procedure are similar to those in which I impute child care expenditures using average expenditure amounts and are available upon request.

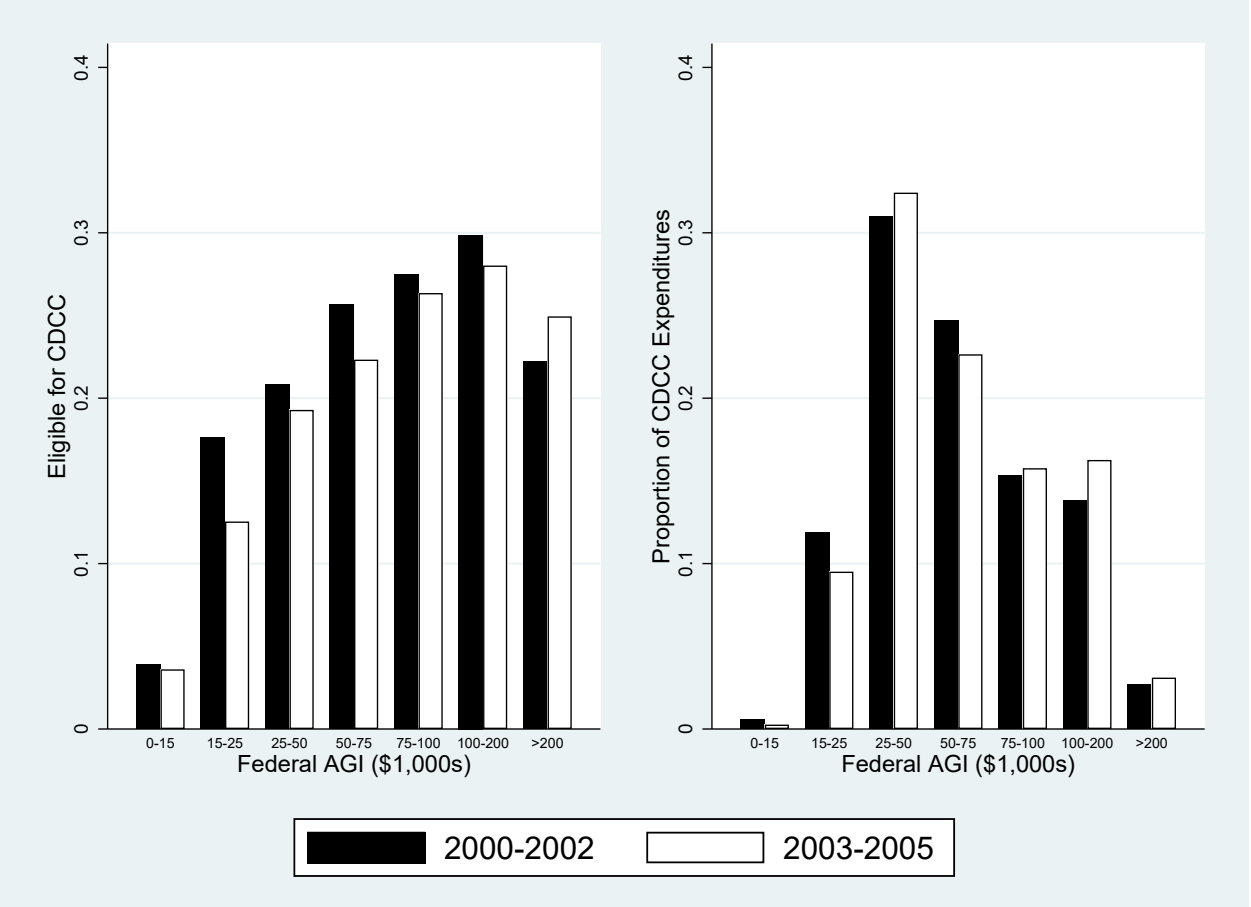
[15]I assume that married taxpayers file as married, filing jointly, and that single taxpayers file as head-of-household. I also assume that all of the household's dividends are nonqualified; the household does not have capital gains; and

of EITC-eligible taxpayers took up the EITC as of 2005, suggests that families with children tax-minimize. Nonetheless, households that use informal child care arrangements in particular may be reluctant to claim CDCC benefits as that requires listing child care providers' Social Security numbers on their tax forms. The SIPP data show that 72 percent of households paying for child care use formal child care arrangements and that 32 percent use informal care. Given nontrivial informal child care participation rates, I likely overestimate CDCC benefits on average in assuming that eligible families claim all child care spending, regardless of mode of care. If I overestimate CDCC benefits, then effects of simulated CDCC benefits are a lower bound on effects of actual CDCC benefits received.

When calculating CDCC eligibility within the March CPS sample, I find that 21 percent of single mothers, 22 percent of single fathers, and 21 percent of married households qualify for CDCC benefits when accounting for nonrefundability. An additional 4 percent of single mothers, 2 percent of single fathers, and 2 percent of married households would qualify for CDCC benefits if the federal CDCC was made refundable, all else equal. The left panel of Figure 3 shows CDCC eligibility by federal AGI categories. Black bars represent eligibility between 2000 and 2002, and white bars represent eligibility between 2003 and 2005. The left panel of Figure 3 shows that CDCC eligibility generally increases with income. Consistent with Figure 2, less than 4 percent of taxpayers with federal AGI under $15,000 are eligible for CDCC benefits both before and after the federal expansion. Nearly 30 percent of taxpayers with between $100,000 and $200,000 in federal AGI, however, are eligible for the CDCC. While eligibility rates remain fairly similar over time, the proportion of eligible households decreases a bit among households with AGI under $200,000 after the expansion. Small decreases in eligibility are consistent with decreases in tax liability generated by the Bush tax cuts.

effects of rent paid, property taxes, and mortgage interest on CDCC benefits are neglible.

Figure 3: CDCC Eligibility and Expenditures by Federal AGI



NOTE: Left panel: Proportion of taxpayers eligible for CDCC benefits from 2000—2002 and 2003-–2005 by federal AGI. Right panel: Proportion of federal CDCC expenditures from 2000–2002 and 2003–2005 by federal AGI.
SOURCE: Left panel: Author's calculations from the March CPS data. Right panel: Author's calculations from the IRS SOI data.

I graph the proportion of total federal CDCC expenditures by federal AGI bins in the right panel of Figure 3. The right panel of Figure 3 confirms that low- and middle-income taxpayers received the majority of federal CDCC benefits relative to the proportion of households eligible; taxpayers with federal AGI between $25,000 and $50,000 received over 30 percent of federal CDCC expenditures both before and after the federal expansion. Very-low- and very-high-income taxpayers combined received less than 4 percent of federal CDCC benefits.

4 Conceptual Framework of CDCC Incentives

Because it is a child care subsidy, the CDCC should distort taxpayers' spending toward child care. In addition, CDCC benefits effectively increase wages net of child care costs. This, combined with the fact that each spouse in the household must work to receive benefits, implies that the CDCC generates an extensive margin labor supply incentive. CDCC incentives for child care and labor supply can be complex, however. For example, increases in time spent in nonparental care or substitution into more expensive child care arrangements may drive increases in child care expenditures. Furthermore, if CDCC benefits increase work participation, then they may increase parents' need for child care.

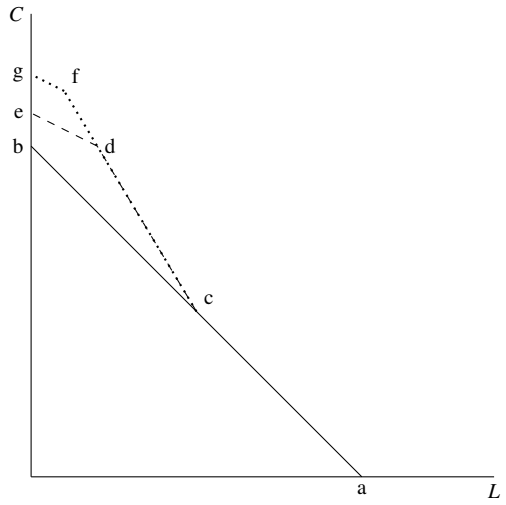
In terms of labor supply, CDCC incentives are fairly straightforward for single parents, who tend to fall in the phase-in region of the credit, where benefits increase as income increases.[16] Suppose that in each period a single parent faces a trade-off between consumption, C, and leisure, L. The parent can supply up to 40 hours of labor. I assume that the parent spends the maximum qualifying child care expenditures and claims the CDCC if they are eligible.[17] The budget constraint is then illustrated by line segment $\overline{ab}$ in Panel (a) of Figure 4, where C equals income plus CDCC benefits.

[16] Ninety percent of single mothers earned less than $43,000 per year between 2000 and 2002.

[17] If the parent spends less than the qualifying child care expenditures, CDCC benefits are less generous, but the budget constraint is otherwise similar. In particular, if child care expenditures increase with hours worked, the budget constraint becomes steeper.

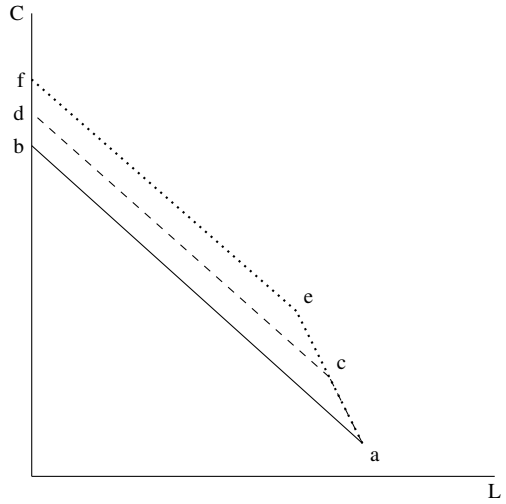
Figure 4: Budget Constraints with CDCC Benefits

(a)



NOTE: The solid line depicts a single parent's budget constraint in the absence of CDCC benefits. The dashed line depicts the single parent's budget constraint with CDCC benefits. The dotted line depicts the single parent's budget constraint if there is an increase in CDCC benefits. "*C*" and "*L*" denote consumption and leisure, respectively.

(b)



NOTE: The solid line depicts the secondary earner's budget constraint in the absence of CDCC benefits. The dashed line depicts the secondary earner's budget constraint with CDCC benefits. The dotted line depicts the secondary earner's budget constraint if there is an increase in CDCC benefits. "*C*" and "*L*" denote consumption and leisure, respectivey.

Panel (a) of Figure 4 shows that the introduction of a nonrefundable CDCC, such as the federal CDCC as of 2002, shifts the single parent's budget constraint from $\overline{ab}$ to $\overline{acde}$. Under the new budget constraint, every choice of hours produces at least as much income and utility as it did before the introduction of the CDCC. The utility of a single parent who does not work does not change

because they are ineligible for CDCC benefits. Similarly, the utility of a single parent who works few hours does not change because their income is too low to benefit from the nonrefundable child care subsidy. Nonetheless, a single parent who preferred working before will still prefer working, and some single parents may find that CDCC benefits make it worth entering the labor force. Therefore, the CDCC unambiguously increases labor force participation among single parents.

The impact of introducing a nonrefundable CDCC on the single parent's hours of work depends on the region of the credit in which they fall before its introduction. For a parent in the phase-in region, the effect on labor supply is theoretically ambiguous. Because the CDCC subsidizes the parent's wage, the substitution effect increases hours, but the income effect decreases hours. For a parent in the phase-out region, where benefits decrease with income, the CDCC unambiguously reduces labor supply because the income and substitution effects are both positive.

The 2003 expansion of the federal CDCC shifts the single parent's budget constraint from $\overline{acde}$ to $\overline{acdfg}$ in Panel (a) of Figure 4. The expansion increases labor force participation among single parents as additional CDCC benefits may induce some of them to enter the labor force. Still, CDCC benefits only increase among single parents with relatively high incomes, which likely mitigates labor supply responses on average. As with the introduction of the CDCC, the impact on work hours depends on the region of the credit in which the parent falls before the credit's expansion. Single parents whose original choices of leisure fall between d and f experience positive income but negative substitution effects, so their labor supply responses are ambiguous. Parents whose original choices of leisure fall between f and g decrease their labor supply as they experience positive income and no subsitution effects.

For married parents, CDCC incentives are more complicated. Both spouses must work to receive benefits, and most married households' income falls in the region of the credit where benefits remain constant as income increases. For simplicity, I assume that the primary earner earns at least \$43,000 per year.[18] Given the primary earner's earnings, dual-parent households are guaranteed a consumption floor at a in Panel (b) of Figure 4. The introduction of the preexpansion nonrefundable CDCC shifts the secondary earner's budget constraint from $\overline{ab}$ to $\overline{acd}$. CDCC benefits increase as income increases along line segment $\overline{ac}$, where child care expenditures exceed the secondary earner's earnings; benefits remain constant at higher earnings levels. Because the introduction of

[18]Secondary earners in low-income married households face budget constraints similar to those of single parents.

the CDCC increases income and utility at each choice of hours, CDCC benefits increase labor force participation. As in Panel (a), impacts on work hours depend on the region of the CDCC in which the secondary earner falls before the introduction of the credit. Secondary earners whose child care expenditures exceed their earnings experience positive income effects and negative substitution effects, so their labor supply response is ambiguous. Secondary earners with higher earnings levels experience only positive income effects and therefore work less.

Panel (b) of Figure 4 illustrates that the 2003 federal CDCC expansion shifts the secondary earner's budget constraint from $\overline{acd}$ to $\overline{acef}$, increasing labor force participation through increases in CDCC benefits. CDCC benefits do not increase among secondary earners with very low levels of earnings, however. Intensive margin labor supply responses among taxpayers in the phase-in region of the CDCC are ambiguous, as they experience positive income and negative substitution effects; taxpayers with high earnings levels experience only positive income effects and work less.

In practice, households' budget constraints are likely more complicated than those in Figure 4. For example, some states provide refundable CDCCs that provide child care subsidies to low-income households. In the online appendix, I show that in this case, low-income parents increase their consumption under the CDCC and that its expansion generates incentives similar to those in Panel (a) of Figure 4. It also is possible that individuals may not be able to perfectly adjust their labor supply to maximize utility (Altonji and Paxson 1992; Bender and Skåtun 2009; Johnson 2010). In the online appendix, I consider the case where individuals must choose among supplying 0, 20, or 40 hours of work per week. In this scenario, both single parents and secondary earners are more likely to work after the CDCC expansion. Secondary earners also experience intensive margin labor supply incentives for which labor supply responses are ambiguous. Finally, interactions between the CDCC and other aspects of the tax code that I discuss in Section 3.2 affect individuals' budget constraints. In the online appendix, I use TAXSIM to graph taxpayers' effective total federal CDCC, CTC, and EITC benefits both before and after the federal CDCC expansion. Incorporating the CTC and EITC into the budget constraint results in figures similar to those in Figure 4, and I account for interactions with other aspects of the tax code in the empirical analyses.

5 Paid Child Care Participation

5.1 Empirical Strategy

I estimate the following model of child care subsidies and paid child care participation separately across single mothers, single fathers, and married households using the March CPS data:

$$Y_{igst} = \beta arcsinh(CDCC_{igst}) + \alpha_g + \alpha_s + \alpha_t + \rho_{st}\Omega + X_{igst}\Gamma + \varepsilon_{igst}, \tag{1}$$

where Y_{igst} is an indicator for annual paid child care participation for household i in demographic group g in state s during year t. The key independent variable, $arcsinh(CDCC_{igst})$, is the inverse hyperbolic sine of inflation-adjusted CDCC benefits for taxpayer i in demographic group g in state s during year t, which I calculate using the procedure documented in Section 3.2. The demographic groups are defined by number of children, the presence of a child younger than age 6, and whether the mother or single father has a college education. α_g, α_s, and α_t are demographic group, state, and year fixed effects, respectively. ρ_{st} denotes state characteristics, including the unemployment rate (Bureau of Labor Statistics 2019), the log of the inflation-adjusted minimum wage (Office of Communication, Wage and Hour Division, U.S. Department of Labor 2018), and an indicator for universal preschool availability (Jordan and Grossmann 2017). X_{igst} denotes individual characteristics, such as age, race, and number of children younger than 17 years old, and ε_{igst} is the error term. I cluster standard errors at the state level. β is the coefficient of interest and represents the semi-elasticity of paid child care participation with respect to CDCC benefits.

I begin by estimating Equation (1) using ordinary least-squares (OLS). OLS estimates are likely inconsistent, however. For example, one can expect a spurious correlation between paid child care participation and CDCC benefits, as income likely affects both child care choices and CDCC benefits. Additionally, changes in tax policy may lead to changes in taxpayers' behavior that are correlated with CDCC benefits. For instance, increased CDCC generosity may increase both paid child care participation and CDCC benefits. Hence, I also estimate Equation (1) using two-stage least-squares.

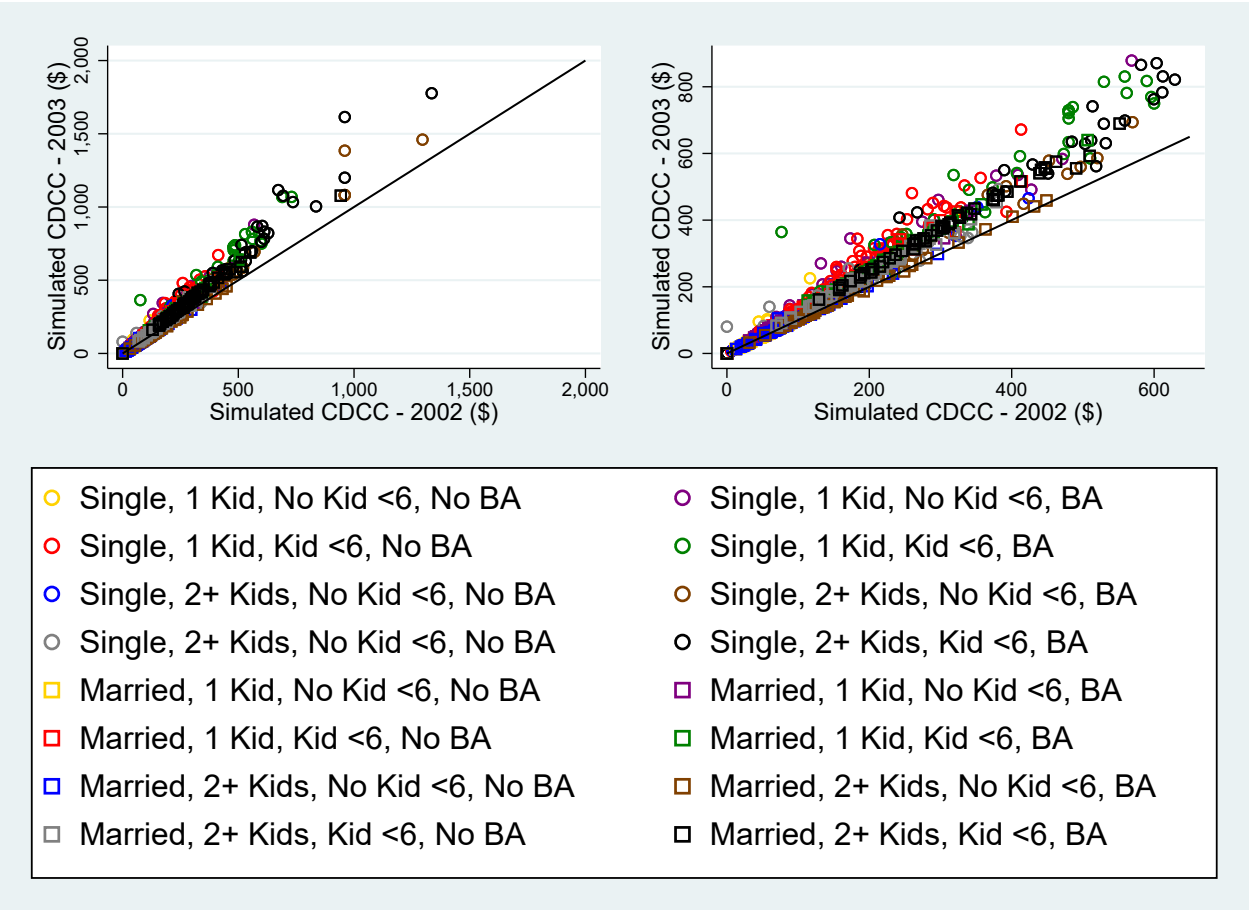
To construct an instrument for CDCC benefits, I start with the subsample of taxpayers who

reported income and paid child care participation for tax year 2002, before the federal CDCC expansion. I then replicate the subsample of taxpayers for each tax year from 2000 through 2008. After converting income and expenditure values into current year dollars, I use TAXSIM to calculate $arcsinh(CDCC_{igst})$ for each replicated taxpayer, had they existed in the current tax year, using the procedure documented in Section 3.2.

Next, I calculate averages of $arcsinh(CDCC_{igst})$ across states, years, and demographic groups, defined by marital status, number of children, child age, and education, using sample weights. These "simulated" CDCC benefit measures summarize changes in tax policy but not individual-level omitted variables that are correlated with both CDCC benefits and outcomes or behavioral responses to changes in the tax code. As a result, identification comes from the federal CDCC expansion and the differential changes in CDCC generosity that it generated across states and family sizes.

Figure 5 illustrates simulated real CDCC benefit measures (in levels) between 2002 and 2003. (The right panel omits simulated CDCC benefits that exceed $650 as of 2002.) In particular, in Figure 5, a unique shape and color represents each demographic group, and each node represents a given state. Figure 5 shows that there is considerable variation in simulated CDCCs across both states and demographic groups between 2002 and 2003. For example, simulated CDCC benefits among college-educated married mothers with at least two children younger than 13 years old and at least one child younger than 6 years old in Iowa increase from $343 in 2002 to $418 in 2003. Simulated CDCC benefits among similar unmarried taxpayers in Iowa increase from $1,336 in 2002 to $1,777 in 2003. Meanwhile, simulated CDCC benefits among college-educated unmarried taxpayers with at least two children younger than 13 years old and at least one child younger than 6 years old increase from $604 to $871 in Arkansas. On the whole, simulated benefits range from $0 to over $1,000 per year and tend to increase with the federal CDCC expansion. Single mothers with two or more children and college degrees have some of the largest simulated CDCC benefits.

Figure 5: Simulated Real CDCC Benefits between 2002 and 2003



NOTE: Simulated real CDCC benefits across demographic groups between 2002 and 2003. Demographic groups are defined by marital status, number of children, child age, and education. Circles and squares represent states. The right panel omits simulated CDCC benefits that exceed $650 as of 2002.

5.2 Results

Table 6 presents estimates of the effects of CDCC benefits on annual paid child care participation among single mothers. The statistically significant OLS estimate in Table 6 suggests that a 10 percent increase in CDCC benefits is associated with a 5 percent increase in annual paid child care participation. Turning to the instrumental variables (IV) estimates, the first stage is strong, with an F-statistic of 31.[19] The statistically significant second-stage IV estimate, 0.119, is nearly identical to the OLS estimate and implies that a 10 percent increase in CDCC benefits causes a 5 percent

[19]Montiel Olea-Pflueger F-statistics generally well exceed 23.1 and are available upon request.

increase in annual paid child care use among single mothers.

Table 6: Effects on Paid Child Care Use among Single Mothers

Variables	OLS child care	First-stage log(CDCC)	Second-stage child care
Log(CDCC)	0.126***		0.119***
	(0.0008)		(0.0141)
Age	−0.001**	−0.017***	−0.001**
	(0.0003)	(0.0026)	(0.0004)
Black	−0.008	−0.088	−0.009
	(0.0045)	(0.0500)	(0.0051)
Kids <17	−0.000	−0.429***	−0.003
	(0.0018)	(0.0208)	(0.0064)
Unemployment rate	0.001	−0.087	−0.000
	(0.0037)	(0.0520)	(0.0036)
Log(min wage)	0.011	−0.039	0.011
	(0.0186)	(0.2135)	(0.0185)
Universal pre-K	0.006	−0.007	0.006
	(0.0056)	(0.1044)	(0.0060)
SimLog(CDCC)		0.118***	
		(0.0211)	
Group, state, year FE	Yes	Yes	Yes
First-stage F-statistic		31	
Mean	0.25		0.25
Observations	36,818	36,818	36,818

NOTE: Effects of a one-unit increase in the inverse hyperbolic sine of CDCC benefits on annual paid child care use among single mothers. Standard errors are clustered at the state level and listed in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Next, Table 7 displays results among married households. The statistically significant OLS estimate implies that a 10 percent increase in child care subsidies is associated with a 6 percent increase in paid child care use among married households. The first-stage IV estimate is strong, with an F-statistic of 27. The statistically significant second-stage estimate, 0.102, is similar to the estimate among single mothers and suggests that a 10 percent increase in CDCC benefits leads to a 4 percent increase in paid child care use.

Table 7: Effects on Paid Child Care Use among Married Households

Variables	OLS child care	First-stage log(CDCC)	Second-stage child care
Log(CDCC)	0.129***		0.102***
	(0.0005)		(0.0240)
Age	0.000	−0.015***	−0.000
	(0.0001)	(0.0022)	(0.0004)
Black	0.006**	0.372***	0.016
	(0.0020)	(0.0390)	(0.0088)
Kids <17	−0.001	−0.384***	−0.011
	(0.0008)	(0.0218)	(0.0092)
Unemployment rate	0.002	0.011	0.002
	(0.0031)	(0.0284)	(0.0028)
Log(min wage)	−0.004	0.132	−0.001
	(0.0074)	(0.1299)	(0.0087)
Universal pre-K	0.007	0.019	0.008
	(0.0048)	(0.0628)	(0.0051)
SimLog(CDCC)		0.258***	
		(0.0496)	
Group, state, year FE	Yes	Yes	Yes
First-stage F-statistic		27	
Mean	0.23		0.23
Observations	134,938	134,938	134,938

NOTE: Effects of a one-unit increase in the inverse hyperbolic sine of CDCC benefits on annual paid child care use among married households. Standard errors are clustered at the state level and listed in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

I also estimate the effects of CDCC benefits on paid child care use among single fathers. The first-stage IV estimate for single fathers is weak, however, with an F-statistic of 5. I therefore treat results for single fathers with caution, but estimated effects are similar to those for single mothers and married households.

Overall, I find dramatic increases in paid child care participation, which corroborates evidence from Miller and Mumford (2015), who find that child care expenditures increased in response to the federal CDCC expansion. Additionally, results are quite similar across single mothers and married households. This is perhaps unsurprising, given similar paid child care participation rates at baseline. Nonetheless, evidence suggests that making the federal CDCC refundable could lead

to larger increases in paid child care use among single mothers, who tend to have lower household incomes.

5.3 Robustness

I test the robustness of results to various sample restrictions and alternative specifications and include results in the online appendix. First, I estimate specifications in which I remove California, Louisiana, Maine, and Vermont, the states that changed their CDCC policies between 2002 and 2003, from the analyses. Results from these specifications are similar to those in the main analyses. Effects among single mothers (coefficient of 0.120, SE = 0.0149) and married households (coefficient of 0.102, SE = 0.0264) are statistically significant and nearly identical to those in Tables 6 and 7, which suggests that changes in CDCC policies in California, Louisiana, Maine, and Vermont do not drive results.

It also is possible that changes in other tax policies for families with children, such as the expansion of the federal CTC in 2003, drive results. To address this concern, I estimate specifications in which I do not include any state- or individual-level controls, some of which are intended to capture effects of the CTC expansions. Estimates from these models suggest that controls play a limited role in determining the coefficients of interest, as estimates are very close to those from the main analyses. The statistically significant effects among single mothers (coefficient of 0.120, SE = 0.0142) and married households (coefficient of 0.103, SE = 0.0240) are quite similar to those in Tables 6 and 7.

In addition, states with more generous CDCC benefits at baseline may have been experiencing differential increases in demand for paid child care use before the federal CDCC expansion, which could drive results. To account for the possibility of differential trends in child care demand across states that are unrelated to CDCC policies, I estimate specifications in which I include linear time trends. Including such trends in the model leaves estimates among single mothers (coefficient of 0.123, SE = 0.0134) and married mothers (coefficient of 0.109, SE = 0.0198) virtually unchanged, so differential trends in child care demand do not seem to drive results.

Another potential concern is that households do not respond to CDCC benefits as of the current tax year because they do not receive benefits until the following spring when they file their taxes. I use the longitudinal nature of the CPS to investigate this possibility. Specifically, I restrict the

sample to households that I observe twice and estimate effects of CDCC benefits as of the previous tax year. This sample restriction reduces sample size considerably and increases standard errors. The effect among single mothers (coefficient of 0.047, SE = 0.0388) is positive but statistically insignificant. The estimate for married mothers (coefficient of 0.130, SE = 0.0204), however, is statistically significant and larger than that in Table 7, which suggests that taxpayers may be more apt to respond to the previous year's CDCC benefits than to the current year's benefits.

Finally, Malik et al. (2018) provide evidence that the number of licensed child care providers per young child varies considerably across geographic areas. Specifically, the authors find that rural areas have fewer child care providers per child than urban areas. In light of this, it is possible that in urban areas, it is easier for parents to substitute away from parental care or unpaid informal child care arrangements into paid child care, especially if licensed child care provision is relatively elastic in areas with many child care centers. To address this, I estimate Equation (1) by households' metropolitan status. Across all demographic groups, effects across metropolitan and nonmetropolitan areas are similar and are not statistically different from one another. Additionally, I use data from the Quarterly Census of Employment and Wages (Bureau of Labor Statistics 2019) to graph changes in average simulated CDCC benefits and numbers of child care centers and workers across states between 2000–2002 and 2003–2005. I do not find evidence that changes in child care supply, as proxied by changes in the numbers of child care centers and workers, are correlated with changes in simulated CDCC benefits. The lack of evidence of a supply response to increased demand for paid child care is in line with evidence from Rodgers (2018), who finds that the federal CDCC expansion increased child care prices. Future work may study the elasticity of paid child care provision with respect to CDCC generosity.

6 Labor Market Outcomes

To investigate the labor market incentives of the CDCC expansion described in Section 4, I study annual employment, usual hours worked per week, and annual earnings. As in Section 5, I estimate Equation (1) using OLS and two-stage least-squares, where Y_{igst} is the outcome of interest for individual i in demographic group g in state s during year t. I estimate models separately across single mothers, single fathers, married mothers, and married fathers.

Table 8 presents estimates of the effects of CDCC benefits on annual employment, usual hours worked per week, and the inverse hyperbolic sine of annual earnings among single mothers. The statistically significant OLS estimate, 0.032, suggests that a 10 percent increase in CDCC benefits is associated with a 0.003 percentage point, or 0.4 percent, increase in employment among single mothers. Turning to the IV estimates, the first stage, which is identical to that in Table 6, is strong, with an F-statistic of 31. The second-stage estimate, 0.032, is positive but statistically insignificant.

Table 8: Effects on Labor Market Outcomes among Single Mothers

Variables	OLS employed	OLS hours	OLS log(earnings)	IV employed	IV hours	IV log(earnings)
Log(CDCC)	0.032***	1.581***	0.416***	0.032	1.409	0.376
	(0.0014)	(0.0468)	(0.0118)	(0.0239)	(0.9427)	(0.2392)
Age	−0.003***	−0.077***	−0.022***	−0.003***	−0.080***	−0.023***
	(0.0005)	(0.0161)	(0.0047)	(0.0006)	(0.0218)	(0.0062)
Black	−0.013	−0.178	−0.119	−0.013	−0.193	−0.122
	(0.0074)	(0.3484)	(0.0800)	(0.0073)	(0.3433)	(0.0808)
Kids <17	−0.022***	−0.829***	−0.275***	−0.023*	−0.903*	−0.292*
	(0.0034)	(0.1548)	(0.0370)	(0.0115)	(0.4522)	(0.1196)
Unemployment rate	−0.003	−0.266	−0.041	−0.004	−0.282	−0.044
	(0.0039)	(0.1910)	(0.0439)	(0.0044)	(0.2161)	(0.0475)
Log(min wage)	0.032	2.112	0.357	0.032	2.104	0.355
	(0.0270)	(1.1343)	(0.3127)	(0.0267)	(1.1104)	(0.3097)
Universal pre-K	−0.004	0.319	−0.034	−0.004	0.318	−0.035
	(0.0140)	(0.6241)	(0.1621)	(0.0138)	(0.6251)	(0.1621)
Group, state, year FE	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-statistic				31	31	31
Mean	0.82	31.73	8.59	0.82	31.73	8.59
Observations	36,818	36,818	36,818	36,818	36,818	36,818

NOTE: Effects of a one-unit increase in the inverse hyperbolic sine of CDCC benefits on labor market outcomes among single mothers. "Employed" indicates whether the individual is employed, "Hours" indicates the number of hours that the individual usually works per week, and "Log(earnings)" is the inverse hyperbolic sine of the individual's annual earnings. Standard errors are clustered at the state level and listed in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Next, I present effects on hours worked per week. The statistically significant OLS estimate of 1.581 implies that a 10 percent increase in child care subsidies is associated with a 0.5 percentage point increase in weekly hours worked among single mothers. The second-stage IV estimate, 1.409, is insignificant but similar to the OLS estimate. The final columns in Table 8 list effects on the inverse hyperbolic sine of annual earnings. The statistically significant OLS coefficient implies that a 10 percent increase in child care subsidies is associated with a 4 percent increase in annual earnings; the second-stage IV estimate, 0.376, is positive but statistically insignificant.

While all OLS coefficient estimates on $arcsinh(CDCC_{igst})$ are highly statistically significant, all second-stage IV estimates are statistically insignificant among single mothers. Evidence from Section 2 suggests that high levels of labor force attachment before the federal CDCC expansion may lead to the statistically insignificant increases in labor supply that I find within this group. Nevertheless, standard errors on IV estimates are fairly large, and I cannot rule out small increases in labor force participation.

Next, Table 9 lists CDCC effects on married mothers' labor market outcomes. The statistically significant OLS employment estimate, 0.052, suggests that a 10 percent increase in CDCC benefits is associated with a 0.7 percent increase in annual employment among married mothers. The first-stage IV estimate is highly statistically significant, with an F-statistic of 29. The marginally significant second-stage estimate, 0.004, is slightly smaller than the OLS estimate and implies that child care subsidies increase employment by 0.6 percent among married mothers.

Table 9: Effects on Labor Market Outcomes among Married Mothers

Variables	OLS employed	OLS hours	OLS log(earnings)	IV employed	IV hours	IV log(earnings)
Log(CDCC)	0.052***	2.207***	0.623***	0.040*	2.042**	0.477**
	(0.0014)	(0.0502)	(0.0154)	(0.0171)	(0.7146)	(0.1799)
Age	−0.000	−0.044***	0.003	−0.001	−0.046***	0.001
	(0.0003)	(0.0125)	(0.0037)	(0.0004)	(0.0133)	(0.0044)
Black	0.103***	6.345***	1.283***	0.107***	6.396***	1.329***
	(0.0055)	(0.2268)	(0.0631)	(0.0080)	(0.3158)	(0.0852)
Kids <17	−0.022***	−0.994***	−0.293***	−0.027***	−1.059***	−0.351***
	(0.0029)	(0.1111)	(0.0314)	(0.0070)	(0.2845)	(0.0740)
Unemployment rate	0.004	0.172	0.035	0.004	0.172	0.035
	(0.0032)	(0.1298)	(0.0358)	(0.0031)	(0.1276)	(0.0346)
Log(min wage)	−0.005	0.175	−0.137	−0.003	0.198	−0.118
	(0.0165)	(0.7510)	(0.2098)	(0.0177)	(0.7873)	(0.2242)
Universal pre-K	−0.001	−0.045	−0.081	−0.001	−0.043	−0.079
	(0.0122)	(0.3561)	(0.1269)	(0.0125)	(0.3578)	(0.1312)
Group, state, year FE	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-statistic				29	29	29
Mean	0.71	25.01	7.46	0.71	25.01	7.46
Observations	127,909	127,909	127,909	127,909	127,909	127,909

NOTE: Effects of a one-unit increase in the inverse hyperbolic sine of CDCC benefits on labor market outcomes among married mothers. "Employed" indicates whether the individual is employed, "Hours" indicates the number of hours that the individual usually works per week, and "Log(earnings)" is the inverse hyperbolic sine of the individual's annual earnings. Standard errors are clustered at the state level and listed in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Turning to hours worked per week, the statistically significant OLS estimate suggests that a 10 percent increase in CDCC benefits is associated with a 0.9 percent increase in weekly hours worked. Similarly, the statistically significant second-stage IV estimate, 2.042, implies that a 10 percent increase in child care subsidies causes a 0.8 percent increase in hours worked among married mothers. Increases in hours worked translate into increases in annual earnings; the second-stage IV estimate, 0.477, suggests that a 10 percent increase in CDCC benefits leads to a 5 percent increase in annual earnings among married mothers.

More generally, Table 9 shows that decreases in child care costs increase labor supply among married women and suggest that, at least to some extent, increases in labor supply account for increases in paid child care participation. Furthermore, if decreases in child care costs enable married mothers to remain in the labor force around childbirth, CDCC benefits may lead to long-run earnings gains (Angelov, Johansson, and Lindahl 2016; Kleven et al. 2019; Kleven, Landais, and Søgaard 2019). To investigate this possibility, Table 10 presents IV estimates across married mothers with and without children younger than two years old. The first-stage IV estimate among mothers with children younger than two years is not particularly strong, with an F-statistic of 17. While I treat second-stage IV estimates as suggestive, they are all positive and statistically significant at conventional levels. The second-stage estimate of the effect on annual employment implies that a 10 percent increase in child care subsidies increases employment among married mothers with very young children by 2 percent. This implies that increased CDCC generosity may mitigate labor force absences around childbirth and that CDCC benefits could lead to long-run increases in mothers' earnings.

Table 10: Effects on Paid Child Care Use and Labor Market Outcomes among Married Mothers by the Presence of a Child Younger than Two Years Old

	Child <2 years				No child <2 years			
Variables	Child care	Employed	Hours	Log(earnings)	Child care	Employed	Hours	Log(earnings)
Log(CDCC)	0.106***	0.103***	4.697***	1.138***	0.096***	0.024	1.535**	0.331*
	(0.0249)	(0.0320)	(1.3257)	(0.3624)	(0.0265)	(0.0189)	(0.7595)	(0.1953)
Age	0.001***	0.001	0.064*	0.023***	−0.001	−0.002***	−0.119***	−0.017***
	(0.0003)	(0.0008)	(0.0334)	(0.0080)	(0.0006)	(0.0005)	(0.0171)	(0.0058)
Black	0.025	0.102***	5.935***	1.214***	0.015*	0.104***	6.293***	1.311***
	(0.0160)	(0.0234)	(0.9531)	(0.2545)	(0.0086)	(0.0089)	(0.3647)	(0.0926)
Kids <17	−0.007	−0.015	−0.415	−0.248*	−0.015	−0.027***	−1.053***	−0.332***
	(0.0098)	(0.0131)	(0.5437)	(0.1423)	(0.0103)	(0.0076)	(0.3010)	(0.0795)
Unemployment rate	0.004	0.008	0.277	0.054	0.001	0.001	0.061	0.009
	(0.0049)	(0.0068)	(0.2490)	(0.0754)	(0.0025)	(0.0032)	(0.1489)	(0.0358)
Log(min wage)	0.017	−0.064*	−3.069*	−0.786*	−0.008	0.003	0.652	−0.042
	(0.0212)	(0.0364)	(1.8375)	(0.4125)	(0.0084)	(0.0174)	(0.8067)	(0.2288)
Universal pre-K	0.001	0.002	0.612	−0.033	0.010*	−0.003	−0.239	−0.099
	(0.0075)	(0.0135)	(0.4769)	(0.1471)	(0.0051)	(0.0134)	(0.4206)	(0.1415)
Group, state, year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-statistic	17	17	17	17	21	22		
Mean	0.30	0.63	21.48	6.62	0.21	0.74	26.01	7.69
Observations	31,532	27,883	27,883	27,883	103,406	100,026	100,026	100,026

NOTE: Effects of a one-unit increase in the inverse hyperbolic sine of CDCC benefits on paid child care participation and labor market outcomes among married mothers by child age. "Child care" indicates annual paid child care use, "Employed" indicates whether the individual is employed, "Hours" indicates the number of hours that the individual usually works per week, and "Log(earnings)" is the inverse hyperbolic sine of the individual's annual earnings. Standard errors are clustered at the state level and listed in parentheses. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Perhaps due to fathers' high levels of labor force attachment, IV estimates of the effects of CDCC benefits on labor market outcomes among fathers are all statistically insignificant; effects among married fathers in particular are quite small. Lack of a labor supply response to child care subsidies among fathers is consistent with findings from existing literature on the effects of expanding highly subsidized child care programs in Europe (Givord and Marbot 2015; Lundin, Mörk, and Öckert 2008).

As in Section 5.3, I test the robustness of the results to alternative sample restrictions and identification assumptions. First, I estimate specifications in which I remove California, Louisiana, Maine, and Vermont from the analyses. Results from these specifications are similar to those from the main analyses. The statistically significant effect on married mothers' employment (coefficient of 0.053, SE = 0.0175) is nearly identical to that in Table 9. Estimates change little in specifications without state- and individual-level controls; the marginally significant employment effect among married mothers (coefficient of 0.041, SE = 0.0174) is in line with the estimate from the main analysis. Estimates also remain stable when I include state-year time trends. The marginally significant employment effect among married mothers (coefficient of 0.043, SE = 0.0177) changes very little. Finally, while estimates of the effects of the previous year's CDCC benefits are noisy for single mothers, effects among married mothers exceed those in Table 9, which implies that parents may not respond to CDCC benefits until they file their taxes. Nevertheless, in no case can I reject the null hypothesis that estimates equal those in the main analyses.

7 Conclusion and Discussion

Taken together, the results suggest that child care subsidies lead to increases in paid child care participation across all family structures and increases in labor supply among married mothers. Still, across all demographic groups, employment effects are smaller than paid child care use effects, which suggests that substitution from parental or informal unpaid child care into paid child care arrangements explains some of the increase in paid child care participation. Increases in paid child care use indicate that the CDCC succeeds in its goal of assisting working parents in paying for child care. Nonetheless, the federal CDCC fails to redistribute income to working parents with the lowest incomes, unlike other U.S. transfer programs, such as the EITC.

More generally, program design and policy effects differ considerably across the CDCC and EITC, both of which target families with children and "make work pay." For instance, many very-low-income families that receive EITC benefits are ineligible for CDCC benefits due to the nonrefundability of the federal CDCC. Hence, it is unsurprising that single mothers, who tend to have lower household incomes, exhibit larger labor supply responses to EITC benefits than to CDCC benefits (Eissa and Liebman 1996; Hoynes and Patel 2018; Keane and Moffitt 1998; Meyer and Rosenbaum 2001). In addition, the requirement that both spouses work to receive CDCC benefits generates an incentive for secondary earners to enter the labor force, whereas the EITC usually generates a negative labor supply incentive among secondary earners. Thus, among married mothers, who tend to be secondary earners, increases in CDCC generosity increase labor supply, while increases in EITC generosity decrease labor supply (Eissa and Hoynes 1998).

Making the federal CDCC refundable would make the credit more in line with the EITC and would increase CDCC eligibility among single mothers by 19 percent, all else equal. Refundability also would increase benefits for the most vulnerable working parents, who currently do not benefit from the federal CDCC. In addition to transferring income to low-income families with children, refundable CDCC benefits would generate extensive margin labor supply incentives that would support the CDCC's goal of helping families work. While CDCC refundability would increase marginal tax rates among low-income families, evidence from the EITC literature suggests that any labor supply responses to increased marginal tax rates likely would be small (Chetty, Friedman, and Saez 2013). Additionally, substantial earnings responses among married mothers, who tend to qualify for the nonrefundable federal CDCC, suggest that there also could be large returns on investment to expanding CDCC generosity for those with higher incomes.

Even under very different circumstances, the increases in paid child care use that I find are consistent with those of the existing literature that estimates the effects of expanding highly subsidized child care programs in Europe and Canada and finds that increases in child care subsidies increase paid child care participation (Baker, Gruber, and Milligan 2008; Givord and Marbot 2015). Furthermore, the relatively large and small labor supply responses among married and single mothers, respectively, are similar to the heterogeneous labor supply responses that researchers find across countries with different levels of female labor supply at baseline (Baker, Gruber, and Milligan 2008; Bettendorf, Jongen, and Muller 2015; Givord and Marbot 2015; Lefebvre and Merrigan

2008).

In crafting CDCC policies, it is important to understand how CDCC benefits affect other outcomes, such as parental time allocation and children's quality of care. For instance, future research may study whether increased CDCC generosity allows parents to adjust their work schedules to maximize utility and, more generally, may provide additional evidence on the channels through which CDCC benefits increase paid child care participation. In addition, future research may address more fully how CDCC benefits lead parents to substitute across various types of child care arrangements, such as parental care, informal unpaid care, informal paid care, and paid formal care. Perhaps most importantly, understanding how CDCC benefits affect children's quality of care and how such effects on child care quality interact with increases in family income will allow policymakers to enact CDCC policies that improve children's short- and long-run outcomes.

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