THE SALIENCE OF COMPLEX TAX CHANGES: EVIDENCE FROM THE CHILD AND DEPENDENT CARE CREDIT EXPANSION

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The literature on tax salience finds taxpayers are less responsive to the financial implications of a low-salience tax change than to an otherwise equivalent price change. This paper adds to this literature by showing that taxpayers are more responsive to the more salient features of a given complex tax change. Data from the Consumer Expenditure Survey are used to show that taxpayers responded to the direct implications of the 2003 expansion of the Child and Dependent Care Credit, but did not respond to the expansion's less salient interactions with other elements of the tax code.

I. INTRODUCTION

Preparing a U.S. personal income tax return can be complicated and time consuming. The IRS reports that 56 percent of taxpayers hired a paid tax professional to complete their federal personal income tax return in 2012.[1] Slemrod and Bakija (2008) estimate that taxpayers spend an average of 26 hours per year performing the record-keeping and paperwork to complete their federal and state personal income tax returns. The complexity of the tax code makes it difficult for taxpayers to understand the tax implications of their economic choices.

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[1] This figure is reported in the IRS *Statistics of Income Bulletin* Winter 2015, Selected Historical and Other Data Tables 1 and 22a, http://www.irs.gov/uac/SOI-Tax-Stats-SOI-Bulletin-Historical-Tables-and-Appendix.

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The literature on tax salience, including papers by Duflo et al. (2006), Gallagher and Muehlegger (2011), Finkelstein (2009), and Chetty, Looney, and Koft (2009), concludes that when the financial incentives of a tax change are not highly salient, the tax change induces a smaller response than an otherwise equivalent price change. This paper adds some nuance to this literature by considering a complex tax change that consists of both a direct tax impact and indirect tax interactions. We propose a simple behavioral model in which taxpayers respond to the direct impact of a complex tax change and do not respond to the less salient interactions with other elements of the tax code. We then examine evidence of such behavior in taxpayers' response to the 2003 expansion of the Child and Dependent Care Credit (CDCC).

The CDCC is an important child-care subsidy that likely influences the amount many families choose to spend on child care through both the quantity and quality margins.[2] For taxpayers focusing only on the 2003 change to the credit itself (the direct impact), the expansion of the CDCC would have appeared as an unambiguous decrease in the after-tax price of child care. However, other tax changes, particularly the simultaneous expansion of the Child Tax Credit (CTC), interacted with the CDCC expansion to often reduce or even eliminate the child-care subsidy. Using individual-level survey data from before and after the CDCC expansion to employ a difference-in-differences estimation strategy, we present evidence showing that taxpayers increased their expenditure on child care in response to the expansion of the CDCC regardless of whether the actual after-tax price of child care increased or decreased.

Taxpayers in the model we present in Section II have limited attention and may choose to only focus on the direct impact of a change to a single tax provision rather than the actual financial implications of the change when the full tax code is considered in its entirety. Focusing on a part of the tax code rather than the whole is similar to what Liebman and Zeckhauser (2004) call spotlighting.[3] Whether individuals consider interactions between provisions of the tax code is distinct but complementary to the literature on whether individuals respond to average or marginal tax rates, such as de Barolome (1995) and Ito (2014). Acquiring information about the change to the CDCC is low cost; figuring out how the CDCC interacts with the rest of the tax code is far more costly. Taxpayers have access to all required information, but both the effort needed to compute after-tax prices and the assumption that interaction effects will be relatively small may lead rational taxpayers to adopt spotlighting behavior.

The rest of the paper proceeds as follows. Section II presents a model of spotlighting behavior with respect to the personal income tax. Section III provides a description of the Child and Dependent Care Credit, its 2003 expansion, and interaction with the Child

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[2] This is discussed by Blau and Robins (1988), Connelly (1992), Averett, Peters, and Waldman (1997), Blau (2003), and Herbst (2010).

[3] Liebman and Zeckhauser (2004) define spotlighting as responding to the instantaneous payoff in the current period without considering the effects for the remainder of the accounting period. Here, we are using this term to describe taxpayers who respond to the direct implications of a single provision of the tax code without considering how their behavior affects total tax liability.

Tax Credit. Section IV describes the data and methodology. Section V describes the results.

II. MODEL

Many deductions and credits have been introduced into the personal income tax code by lawmakers interested in encouraging certain activities. If the government wants to provide a subsidy for some activity it may be easier and more administratively efficient to introduce a targeted deduction or credit into the personal income tax system than to create an entirely new system to provide the subsidy.[4] But there are broad concerns that such tax expenditures can result in perverse impacts on revenue, significant distributional effects, and distorted taxpayer behavior.[5] As more targeted deductions and credits piggyback on the personal income tax, these tax provisions interact with each other and at times cause incentives to diverge from what was originally intended.

For taxpayers to make consumption decisions optimally, they must know the after-tax prices they face. Taxpayers who gather only the information required to claim the relevant deductions and credits but do not understand how they interact may calculate a "naive" after-tax price that is far different than a "nuanced" after-tax price which considers these interactions.

We model the personal income tax as a function

$$(1) \quad Tax = f(y, X, \tau_1(y, X, Z), ..., \tau_n(y, X, Z)),$$

which depends on the taxpayer's income, y, family size and other taxpayer characteristics, X, and n credits or deductions given by $\tau_i(y, X, Z)$, where Z denotes other taxpayer characteristics that influence the value of specific credits or deductions. The complexity of the function $f(\cdot)$ is primarily due to the fact that the credits and deductions interact with each other as well as with y and X. However, each of the individual credits and deductions are generally simple functions with few inputs.

Suppose that to encourage a specific action or to reduce the tax burden for a group of taxpayers, a particular tax credit is increased from $\tau_i(y, X, Z)$ to $\tau'_i(y, X, Z)$. The literature gives two explanations for why we observe a smaller aggregate response to a tax change than to an equivalent price change. First, some taxpayers are inattentive and may not realize that the particular tax provision has changed (a type of price misperception) and thus will not respond. Second, taxpayers who observe the change may believe that calculation and adjustment costs will be greater than the utility gain from the optimal response and thus choose to not respond to the tax change. We offer a third explanation, which we call spotlighting behavior.

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[4] Piggybacking a proposed subsidy or transfer payment onto the personal income tax system may not be efficient if the targeted beneficiaries of the proposed subsidy do not generally file tax returns. For example, the tax system would probably not be a good delivery mechanism for disability benefits.

[5] For example, see the articles on tax expenditures in the June 2011 special issue of the *National Tax Journal*.

Taxpayers engaged in spotlighting behavior use an easy (low utility cost) way to approximate the effect of the tax change, holding all other factors constant

$$(2) \quad \Delta Tax_S \approx -\tau'_i(y, X, Z) + \tau_i(y, X, Z),$$

where the s subscript denotes the use of the spotlighting approximation. An increase in the tax credit from $\tau_i(y, X, Z)$ to $\tau'_i(y, X, Z)$ often causes a proportional reduction in the tax liability which provides justification for spotlighting behavior. However, this is not always the case. The change in tax liability depends on a more nuanced understanding of how the tax credit interacts with the other arguments of the tax function. Given full information including end of year income, the change in tax liability from a change to tax provision i is given by

$$(3) \quad \Delta Tax = f\left(y, X, ..., \tau'_i(y, X, Z), ...\right) - f\left(y, X, ..., \tau_i(y, X, Z), ...\right).$$

For example, suppose that $\tau_i(y, X, Z)$ is a tax credit that provides partial reimbursement of expenditure on a specific good where z denotes expenditure on that good. Taxpayers using spotlighting would approximate the after-tax price of this good as

$$(4) \quad \text{After-tax price} \approx p\left(1 - \frac{\partial \tau_i(y, X, z)}{\partial z}\bigg|_{z=z^*}\right),$$

where p is the pre-tax price of the good and z^* is the chosen level of expenditure. However, the actual after-tax price of the good is

$$(5) \quad \text{After-tax price} = p\left(1 + \frac{\partial f(y, X, ..., \tau_i(y, X, z), ...)}{\partial z}\bigg|_{z=z^*}\right).$$

Spotlighting may generally provide a good approximation of the after-tax price. It is likely that small deviations from the frictionless (no price misperception) optimum due to spotlighting cause only a small reduction in utility, as in Chetty (2012). However, in situations with important interactions like the 2003 expansion of the CDCC, spotlighting can lead to a large misperception of the after-tax price. The low salience of interactions can lead to a large deviation from the frictionless optimum even when the direct financial implications are salient.

III. CHILD AND DEPENDENT CARE CREDIT

A. Historical Background

The Child and Dependent Care Credit (CDCC) began in 1954 as an itemized deduction for work-related child-care expenses. The itemized deduction was limited to households making less than $4,500 annually and was limited to $600 in total child-care

expenses. In practice, few households claimed the deduction as only those that itemized their deductions were eligible. Updates to the deduction in 1964 and 1971 did little to increase the number of households that benefited, so in 1976 Congress replaced the child-care deduction with a credit. As a credit, the benefits were no longer linked to itemizing, so in theory households at any income level could receive the subsidy. But as a non-refundable credit, CDCC benefits remained limited to households with tax liability, excluding many low-income households.

In 1981, the credit value was changed to a schedule starting at 30 percent and then moving down to 20 percent in steps occurring at specific income levels. The limit was increased to $2,400 of qualified child-care expenses per child.[6] There were no changes to the CDCC from 1981 until 2003, which, because it is not inflation indexed, caused its value to taxpayers to decline substantially.

In 2001, Congress increased the qualifying expenses limit to $3,000 per child and increased the credit rate schedule for low-income families.[7] Though passed in 2001, the CDCC expansion was not scheduled to take effect until the beginning of 2003. As shown in Panel A of Figure 1, the CDCC rate schedule only increased for taxpayers with an adjusted gross income (AGI) below $43,000.[8]

B. Interaction with the Child Tax Credit

The Child Tax Credit (CTC) is best described as a lump-sum transfer to taxpayers with children, while the CDCC is a partial reimbursement of child-care expenses. As mentioned above, the CDCC is a non-refundable credit, meaning that only taxpayers with tax liability benefit. In contrast, the CTC is refundable, meaning that taxpayers without remaining tax liability can still benefit. The refundable portion of the Child Tax Credit is called the Additional Child Tax Credit (ACTC). Taxpayers with no remaining tax liability who have not yet claimed the full value of the CTC can claim the remaining amount through the ACTC. However, prior to 2008, the ACTC was limited for low-income taxpayers.[9] For example, in 2003 the refund could not exceed 10 percent of the taxpayer's earned income in excess of $10,500. When this ACTC constraint binds, the taxpayer is not able to claim the full value of the CTC.

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[6] To qualify, the child care must enable parents in the household to work or look for work. The care provider cannot be a parent or an older sibling of the child. Taxpayers who participate in a dependent care assistance plan (child-care flexible spending account plan) through their employer are only eligible to claim child-care expenditure for the CDCC that is not paid out of the flex spending account, and this is limited to the CDCC max. A flex spending plan allows an employee to place up to $5,000 of pre-tax income into an account for child-care expenses.

[7] The Economic Growth and Tax Relief Reconciliation Act of 2001 increase the maximum Child and Dependent Care Credit to 35 percent of child-care expenditure (from 30 percent) of up to $3,000 (from $2,400) for one child and of up to $6,000 (from $4,800) for two or more children. The phase-out of the credit rate was moved to begin at $15,000 of adjusted gross income (from $10,000).

[8] Married couples can only claim the CDCC if both spouses are working (or if the non-working spouse is a student or disabled) and the amount of child-care expenses used in calculating the credit is limited to the amount of earned income of the lesser-earning spouse.

[9] Prior to 2001, only taxpayers with three or more children could receive the ACTC, and the ACTC was limited to their payroll tax liability. The CTC itself was introduced in the Taxpayer Relief Act of 1997, so the CDCC had no interactions with the CTC prior to this point.

Figure 1
Child and Dependent Care Credit Rate Increase

(A) Naive Credit Value

(B) Nuanced Credit Value
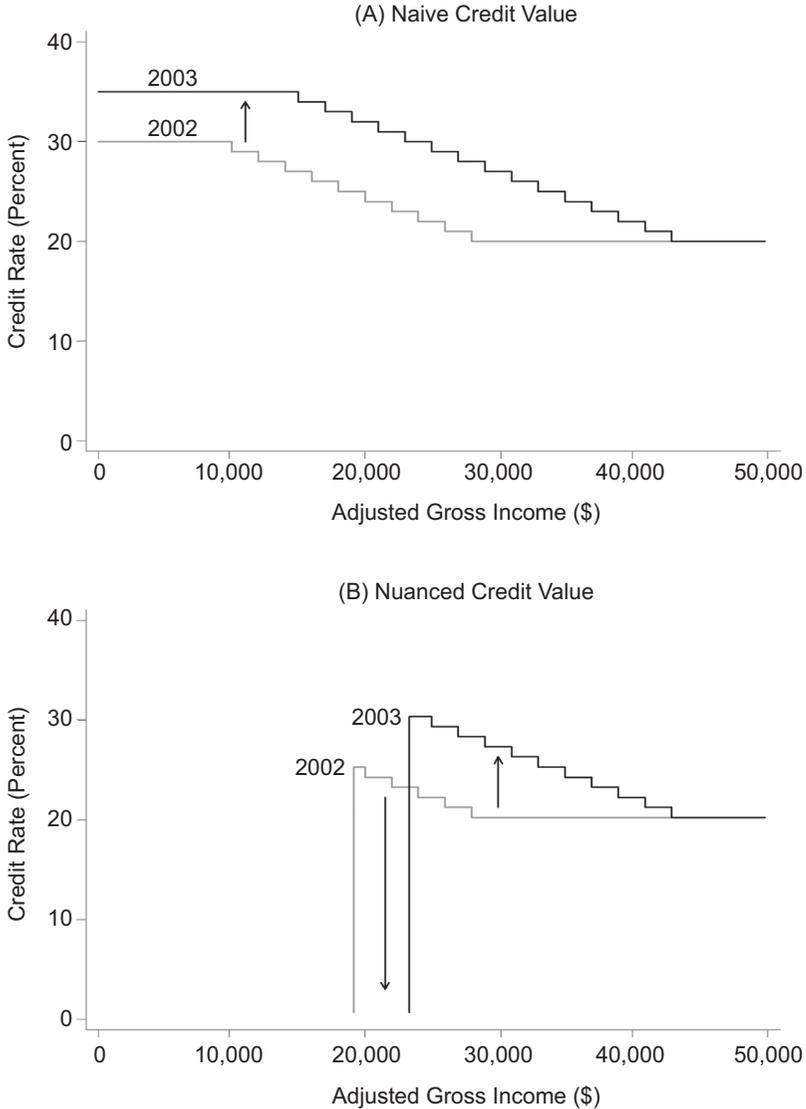
Notes: This figure illustrates the percent of the first dollar of child-care expenditure that is refunded through the CDCC to a single-parent household with two children. Panel A presents the naive value of the CDCC which does not consider interactions with other elements of the tax code. Panel B presents the nuanced value of the CDCC where interactions with all other elements of the tax code are considered. Because the CDCC is a non-refundable tax credit, many low-income taxpayers do not benefit from this credit.

In 2002, the year before the CDCC expansion, the CTC provided a credit of $600 per child to taxpayers with children. At the time, the U.S. was experiencing a mild recession. With the primary motivation of stimulating the economy through advanced tax refunds, the Jobs Growth and Tax Relief Reconciliation Act of 2003 increased the CTC to $1,000 per child and provided advance tax refund checks of $400 per child (the amount of the increase in the CTC).

The timing of the CTC increase happened to coincide with the expansion of the CDCC, even though the CDCC expansion had been passed two years earlier. Taxpayers with children first appear to have received both a decrease in the marginal cost of child care through the CDCC and a lump sum transfer from the increase of the Child Tax Credit. However, taxpayers with insufficient tax liability did not fully benefit from the CDCC and CTC increases. The CDCC appears before the CTC on the tax form (Figure 2). As a

Figure 2

IRS 1040 Form (2003)

Notes: This is the top portion of page 2 of the 1040 form for year 2003. Line 45 is the Child and Dependent Care Credit (CDCC), line 49 is the Child Tax Credit (CTC), and Line 65 is the Additional Child Tax Credit (ACTC). The stacking order of the credits on the 1040 form has remained the same since 2003.

result, for some, the increase in the CDCC reduced the amount of tax that was left to be claimed for the CTC, which in turn shifted CTC benefits to the ACTC. But as soon as the income constraint on the ACTC became binding, any benefits from claiming additional child-care expenses through the CDCC were offset by an equivalent decrease in the CTC value and no change in ACTC value. In addition, the Economic Growth and Tax Relief Reconciliation Act of 2001 reduced tax rates and increased the standard deduction causing there to be even less tax liability for the non-refundable CDCC to absorb.

As soon as the income constraint on the ACTC becomes binding, any benefits from claiming additional child-care expenses through the CDCC were offset by an equivalent decrease the CTC value and no change in ACTC value. Because the final tax liability and refunds for these taxpayers were not affected by the amount of child-care expenditure claimed, the marginal subsidy on child care became zero. This is illustrated in Panel B of Figure 1 for a single-parent household with two children. This particular issue affects few taxpayers today, as the ACTC's income constraint has been significantly relaxed.[10]

The CDCC interaction with the CTC was not obvious to taxpayers. Using tax preparation software may have increased awareness of the change to the CDCC, as several leading brands of tax preparation software ask specifically about child-care expenditure and give the value of the CDCC reported on the 1040 form. Because it focuses attention on the value reported on the 1040 form, tax preparation software may have increased the use of spotlighting by taxpayers.[11]

We are not aware of any evidence regarding the extent to which members of Congress understood that other changes in the tax code after 2001, including the CTC increase, would reduce the value of the CDCC expansion for low-income taxpayer. The extent of Congress' awareness is not important to the identification strategy in this paper, and we do not wish to suggest it was the intention of Congress to leave low-income taxpayers with a reduced child-care subsidy rather than the legislated increase.

C. Response of Child Care to Child-Care Subsidies

The literature shows that taxpayers respond to a reduction in the price of child care by purchasing more child care. Blau and Robins (1988) provide direct evidence in a model of labor supply, fertility, and child-care expenditure where the price variation comes from a child-care subsidy. Other papers including Connelly (1992), Averett, Peters, and Waldman (1997), and Herbst (2010) examine the responsiveness indirectly through a change in the labor force participation of mothers with young children, under the assumption that these working mothers are consumers of child care. Blau (2003)

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[10] The income constraint was partially relaxed in 2008. By 2009, the ACTC reached its present constraint of being limited to 15 percent of income in excess of $3,000.

[11] In 2003, 52 percent of personal income tax returns from households with adjusted gross income between $15,000 and $50,000 were filed electronically. By 2008, 71 percent of returns were filed electronically for this group. Online filing (electronic filing not performed by a tax professional) has become increasingly popular over time, and represented the majority of all electronic filings by 2009 (IRS *Statistics of Income Bulletin* Winter 2005, http://www.irs.gov/uac/SOI-Tax-Stats---SOI-Bulletin:-Winter-2004-2005, and IRS *Statistics of Income Bulletin* Winter 2010, http://www.irs.gov/uac/SOI-Tax-Stats---SOI-Bulletin:-Winter-2010).

surveys the literature on the elasticity of employment with respect to the price of child care and finds estimates ranging from 0.06 to –1.26.

How taxpayers respond to the 2003 expansion of the CDCC depends on their perception of how the after-tax cost of child care was affected. All else equal, the child-care expenditure decisions of taxpayers who are primarily ignorant of the 2003 CDCC expansion should remain unchanged. Taxpayers who primarily use the spotlighting method should increase their child care expenditure in response to an increase in the "naive" measure of the value of the CDCC. Taxpayers who account for interactions between elements of the tax code should increase or decrease their child-care expenditure in response to a "nuanced" measure that considers interactions between the CDCC and other elements of the tax code. If there are a substantial number of both fully-informed taxpayers and those who are spotlighting, then we would expect to see a response to both the naive and the nuanced change in the value of the CDCC.

IV. DATA AND EMPIRICAL STRATEGY

A. Data

We use data from the diary portion of the U.S. Bureau of Labor Statistics Consumer Expenditure Survey (CES). Each survey participant records all household expenditures for a one-week period in a provided diary. This diary is collected at the end of the week and an interview is conducted to obtain demographic and income information. The participant then records all household expenditure for a second one-week period. Note that because each household is surveyed only once, the data are a series of cross sections rather than a true panel. We select three years, 2000–2002, to represent the pre-CDCC expansion period and the following three years, 2003–2005, to represent the post-CDCC expansion period.

Only households with at least one child under age 13 are included in the analysis.[12] The tax interaction between the CDCC and the CTC was generally limited to taxpayers with $10,000 to $50,000 of family income, so we only include families within this income range.[13] Married taxpayers with only one earner are not eligible for the CDCC and have much lower rates of using child care, so these taxpayers are also excluded from the analysis. In this sample of low-income households with children, 26.2 percent were subject to the ACTC income constraint and thus were unable to claim their maximum CTC benefits through the ACTC. When also considering the CDCC, 46.0 percent of the sample were unable to claim the combined maximum value of the CDCC, CTC, and ACTC.

Summary statistics for our sample of households are given in Table 1. Our sample contains 2,682 households with young children, 268 of which paid for child care during the two-week survey. The child-care measure includes all expenditure for daycare,

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[12] This matches requirements to claim the CDCC, as the dependent qualifying child must be under age 13.

[13] We use the wage and salary income received by all household members in the previous 12 months as the measure of family income. The consumer expenditure survey began imputing some missing income component values in 2004. To make the income measure comparable over the years of our study we remove imputed incomes which makes the income measure comparable across all years of the this study.

Table 1

Summary Statistics

Panel A: Full Sample

| Variables | 2000–2002 | | 2003–2005 | | H_0: |
	Mean	Standard Deviation	Mean	Standard Deviation	Pre=Post
Expenditure on child care	15.89	92.47	13.50	53.55	0.4046
Expenditure on babysitting	10.59	46.58	8.90	41.95	0.3262
Expenditure on nondurables	445.50	279.73	473.42	304.55	0.0067
Expenditure on all categories	1,139.1	1,014.5	1,256.5	1,454.0	0.0231
Naive CDCC value pre	791.00	287.46	779.35	288.76	0.3314
Naive CDCC value post	1,206.9	470.81	1,185.2	473.03	0.2674
Naive CDCC value change	415.92	206.80	405.81	208.84	0.2414
Nuanced CDCC value pre	512.88	355.94	515.21	351.21	0.8732
Nuanced CDCC value post	551.00	463.70	575.41	456.18	0.2005
Nuanced CDCC value change	38.12	289.50	60.20	270.51	0.0525
Naive discount pre	22.22	3.04	22.12	3.00	0.4344
Naive discount post	27.12	5.22	26.91	5.22	0.3365
Naive discount change	4.90	2.91	4.79	2.96	0.3660
Nuanced discount pre	16.28	8.88	16.50	8.65	0.5434
Nuanced discount post	17.18	11.82	17.63	11.50	0.3534
Nuanced discount change	0.90	7.80	1.13	7.49	0.4721
Income	30,132	11,352	30,515	11,322	0.4207
Married (indicator variable)	0.59	0.49	0.50	0.50	0.0000
Number of children	1.70	0.92	1.65	0.83	0.1428
Observations	1,573		1,109		

	2000–2002		2003–2005		H_0:
Variables	Mean	Standard Deviation	Mean	Standard Deviation	Pre=Post
Expenditure on child care	146.38	244.89	145.79	108.53	0.9788
Expenditure on babysitting	13.07	38.47	12.70	39.42	0.9413
Expenditure on nondurables	494.73	273.78	526.54	336.40	0.4236
Expenditure on all categories	1,485.2	1,086.1	1,589.1	1,154.4	0.4850
Naive CDCC value pre	782.97	281.00	782.48	294.12	0.9900
Naive CDCC value post	1,178.1	470.15	1,186.8	475.59	0.8927
Naive CDCC value change	395.16	214.98	404.30	211.13	0.7504
Nuanced CDCC value pre	586.50	335.68	536.77	352.85	0.2924
Nuanced CDCC value post	663.34	453.58	625.14	447.48	0.5312
Nuanced CDCC value change	76.84	275.80	88.37	257.86	0.7313
Naive discount pre	21.67	2.70	22.01	2.83	0.3787
Naive discount post	26.00	5.18	26.83	5.28	0.2442
Naive discount change	4.33	3.13	4.82	3.16	0.2431
Nuanced discount pre	17.74	7.64	16.78	8.45	0.4018
Nuanced discount post	19.37	10.50	19.15	11.05	0.8795
Nuanced discount change	1.64	6.79	2.36	5.96	0.3944
Income	32,709	11,304	30,806	11,401	0.2166
Married (indicator variable)	0.55	0.50	0.53	0.50	0.8374
Number of children	1.70	0.87	1.63	0.78	0.5259
Observations	167		101		

Panel B: Households with Expenditure on Child Care

Notes: These data are from the Consumer Expenditure Survey and only include households with at least one child under age 13 and self-reported family income between $10,000 and $50,000. Married couples with only one working spouse are excluded from the data. Expenditure values are from a two-week diary from years 2000–2005. Spending on nondurable goods is defined as in Johnson, Parker, and Souleles (2006) as spending on goods and services which can only be used once and last no more than 3 years at most. The final column reports the p-values from the null hypothesis that the mean is the same in both the pre- and post-evaluation periods. Sample weights are used in the calculations.

nursery, and preschool, including any tuition payments for preschool. The child-care measure does not include tuition payments for K-12 education, but would include other forms of formal child care. Babysitting is not included in the child-care measure as babysitting expenditure for non-work purposes cannot be used to claim the CDCC. A limitation of the CES two-week diary data is that some households that use child-care services pay for those services monthly, which will cause us to incorrectly categorize some households as not having any child-care expenditure. However, it should not do so in a way that is correlated with the CDCC expansion. Tests for differences in the means reported in Table 1 show that the pre- and post-expansion periods are largely comparable, particularly for households with expenditure on child care. Inflation likely plays a role in the increase in spending over time as these figures are not inflation adjusted.

For each household, regardless of the year in which we observe them, we calculate a naive and nuanced measure of the value of the CDCC under both the pre-expansion (we use 2001) and the post-expansion (we use 2005) tax rules. Because we do not observe the chosen consumption level of each household under both tax rules, we cannot directly observe the change in total claimed benefits or marginal price. We can calculate two alternative measures, the change in maximum claimable benefits and the change in the cent per dollar discount on first-dollar marginal price. We refer to these measures respectively as the value of the CDCC and the child-care discount.

For maximum claimable benefits, the naive value of the CDCC is calculated as the statutory value of the credit if the taxpayer spent enough on child care to reach the qualifying expenses limit for their household income.[14] This method does not consider any tax interactions and is how a taxpayer using spotlighting would approximate the value of the CDCC. The nuanced value of the CDCC is calculated as the difference in final tax liability by changing child-care spending from zero to the qualifying expense limit, holding all other factors constant. This method allows for interactions with other tax provisions.

For the discount on first-dollar marginal child-care price, the naive discount is calculated as the CDCC credit the taxpayer could claim if their spending changed from zero to one dollar of expenditure on child care.[15] In calculating the naive discount, only the marginal credit rate shown in Panel A of Figure 1 is considered. Whether the taxpayer has any remaining tax liability is ignored. A taxpayer with less than $10,000 of income would have a naive discount of 30 cents for the first dollar of child-care expenditure before the tax change, and a naive discount of 35 cents after the tax change. This method does not consider any tax interactions and is how a taxpayer using spotlighting would approximate the first-dollar marginal cost of child care under the CDCC. The nuanced discount is calculated as the total change in tax liability or refund for the taxpayer if their child-care spending changed from zero to one dollar of expenditure. As shown in

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[14] Spending levels of $3,000 for one young child and $6,000 for two or more young children are sufficient for claiming maximum benefits in both periods.

[15] Using the discount amount (1 – marginal price) rather than the marginal price makes the interpretation of coefficients similar to the CDCC value approach.

Panel B of Figure 1, the nuanced discount is zero if the ACTC income constraint binds, as any benefits from the CDCC would be offset by losses in the CTC.[16]

For both the pre- and post-expansion groups, the naive value of the CDCC is about $400 larger on average (a 50 percent increase) when calculated using the post-expansion tax rules as compared to the pre-expansion tax rules. The change from pre- to post-expansion tax rules in the nuanced value of the CDCC was significantly smaller than the naive value for both the pre- and post-expansion groups (t-values of 42.12 and 33.68, respectively). Similarly, Table 1 shows that the naive marginal price of child care decreased by a little less than 5 cents for the first dollar of child-care expenditure. Again, the nuanced change in the discount was significantly smaller than the naive change for both the pre- and post-expansion groups (t-values of 19.06 and 15.13, respectively).

Figure 3 shows the income distribution of households in our sample that saw an increase or a decrease in the nuanced value of the CDCC in Panel A and similarly in the nuanced child-care discount in Panel B. As expected, households with an increase in the nuanced CDCC value had higher incomes than households which saw a decrease (t-value 36.54), and households with an increase in the nuanced child-care discount were also more likely to have higher incomes (t-value 18.17). Yet, there is extensive overlap in the income distributions in both Panels A and B.

Figure 4 plots the changes in the naive and nuanced CDCC values by family income. Panel A shows that every household in our sample would have experienced an increase in the naive CDCC value between the pre- and post-expansion period with the largest increases concentrated among low-income households. The lower grouping of data points in Panel A is for households with one young child while those with more than one young child are in the higher grouping. Panel B shows the change in the nuanced value of the CDCC for each household in our sample and illustrates the heterogeneity of the change for households with similar levels of income. In our sample, 22.7 percent of households experienced a decrease in the nuanced value of the CDCC, 22.4 percent experienced no change, and 54 percent experienced an increase.

Figure 5 plots the naive and nuanced change in the first-dollar discount by family income. Panel A shows that the naive child-care discount increased for every family in our sample with income below $43,000. Panel B shows the change in the nuanced discount and illustrates that households with similar income can experience very different changes in the nuanced after-tax price of child care. In our sample, 7.5 percent of households experienced an increase in the first-dollar marginal price of child care, 38.6 percent of households experienced no change, and 54.0 percent of households experienced a decrease.

Differences in both the value of the CDCC and the price of child care are based only on change in the tax code and not on household differences over time. These figures describe a tax change that appeared to provide (if spotlighting) a large child-care subsidy

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[16] We do not adjust for the minimum value of the ACTC which may apply to families with three or more children. This means some households with binding minimums may be assigned non-zero changes in the first-dollar discounts when their true change is zero. Our results are robust to excluding all households with three or more children.

Figure 3

Income Distribution of Households by Group
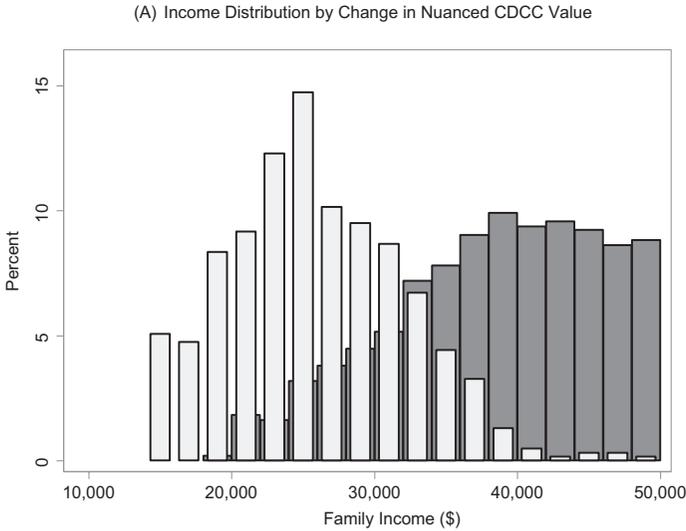
(A) Income Distribution by Change in Nuanced CDCC Value

Families with a Decrease in Nuanced CDCC Value

Families with an Increase in Nuanced CDCC Value

(B) Income Distribution by Change in Nuanced Price of Child Care
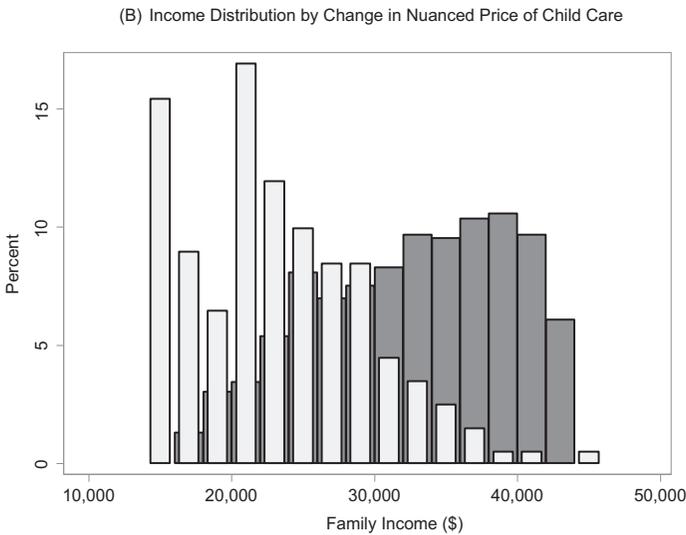
Families with an Increase in Nuanced Price of Child Care

Families with a Decrease in Nuanced Price of Child Care

Notes: These data include all CES households from 2000 to 2005 with at least one child under age 13 and income between $10,000 and $50,000. The income distribution for the two groups (those with a decrease in the nuanced price of child care and those with an increase in the nuanced price of child care) were graphed separately and then combined into this figure. Households with no change in the nuanced price of child-care do not appear on this figure.

Figure 4

Change in the Naive and Nuanced Value of the CDCC and Income
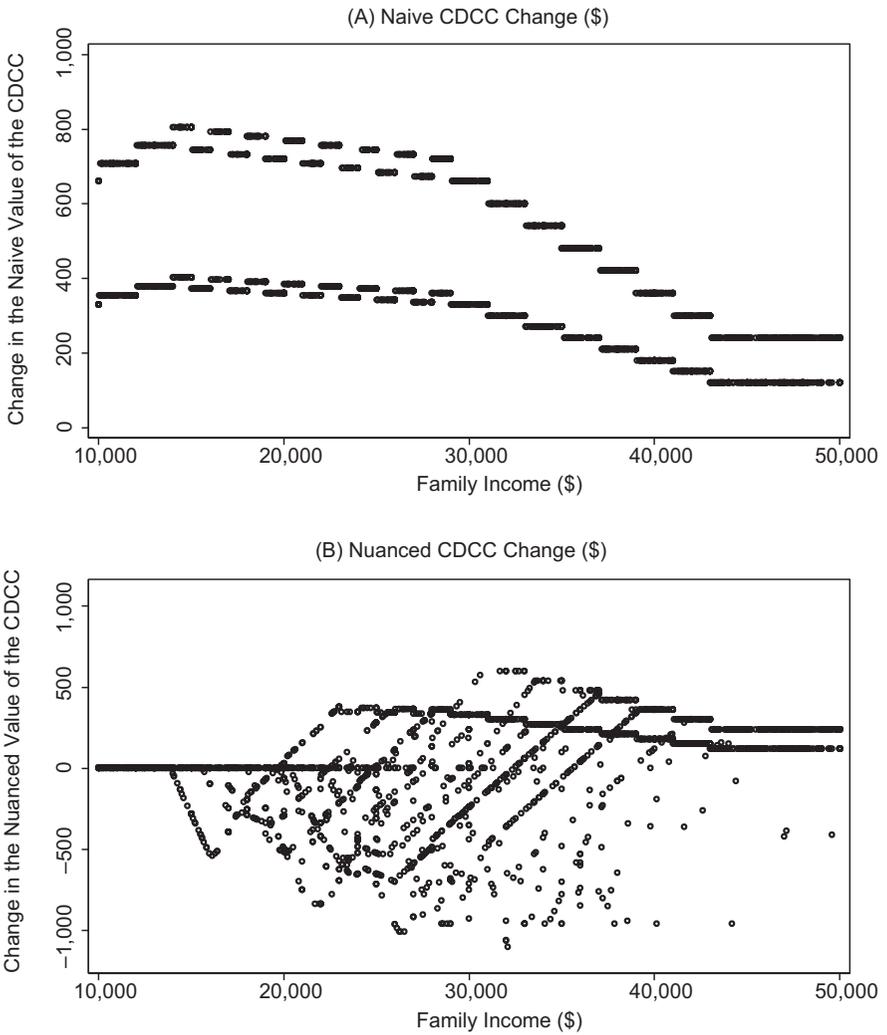
(A) Naive CDCC Change ($)

(B) Nuanced CDCC Change ($)

Notes: Panel A and Panel B depict each family in the data as a circle with family income on the x-axis. The y-axis in Panel A is the change in the maximum value of the child and dependent care credit between 2000 and 2005 if it were a fully refundable credit. The y-axis in Panel B is the change in the nuanced value of the child and dependent care credit (a non-refundable credit) between 2000 and 2005.

Figure 5
Change in the Naive and Nuanced Value of the CDCC and Income
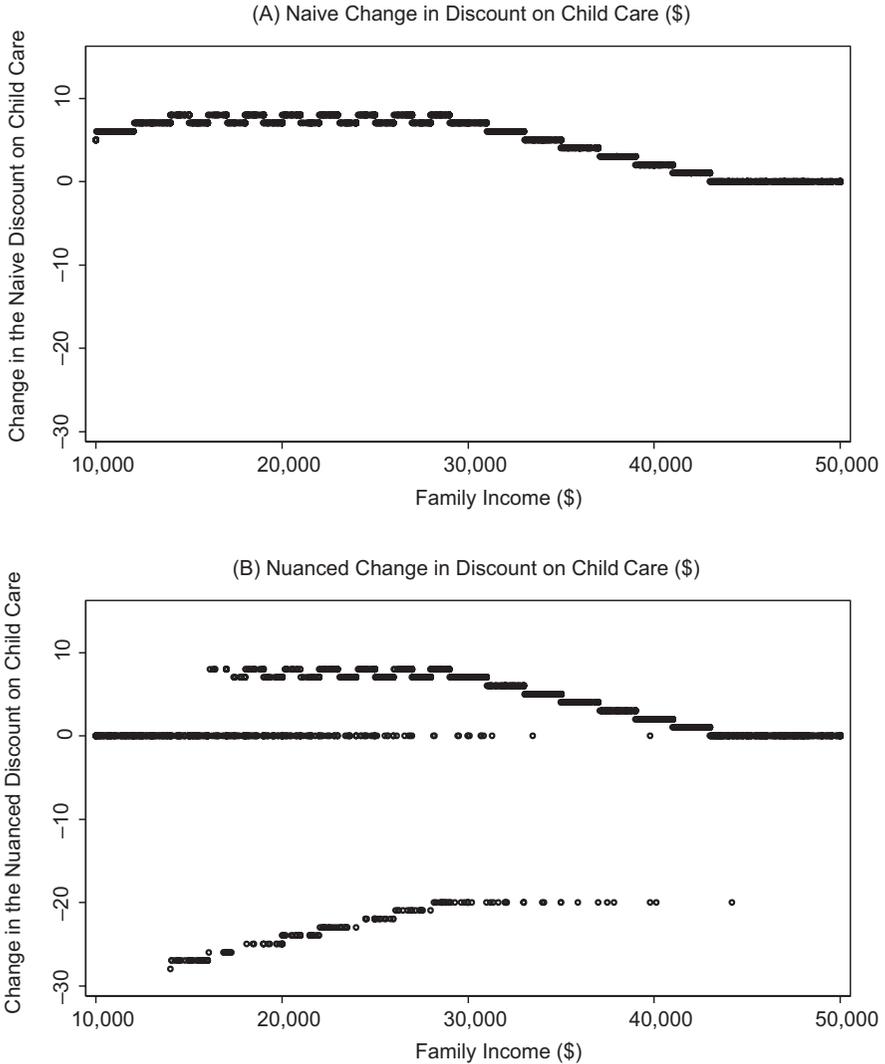
(A) Naive Change in Discount on Child Care ($)

(B) Nuanced Change in Discount on Child Care ($)

Notes: Panel A and Panel B depict each family in the data as a circle with family income on the x-axis. The y-axis in Panel A is the change between 2000 and 2005 in the value of the Child and Dependent Care Credit in cents if the credit were fully refundable assuming one dollar of child-care expenditure. The y-axis in Panel B is the change between 2000 and 2005 in the nuanced value of the CDCC in cents.

to the low-income households in our sample. Yet for many low-income taxpayers, the nuanced value of the CDCC and nuanced price of child care remained unchanged or even moved in the opposite direction of the naive change.

B. Empirical Specification

By estimating the response of child-care spending to changes in the naive and nuanced value of the CDCC we are testing whether taxpayers are primarily ignorant of the CDCC change, are engaging in spotlighting, or are well-informed about the financial implications of the CDCC expansion. We estimate regression models of the form

$$(6) \quad E_{it} = \beta_0 + \beta_1\left(Post_t \times \Delta CDCC_{it}^{V}\right) + \beta_2 \Delta CDCC_{it}^{V} + \beta_3\left(Post_t \times \Delta CDCC_{it}^{U}\right)$$
$$+ \beta_4 \Delta CDCC_{it}^{U} + \gamma X_{it} + \theta_t + \varepsilon_{it},$$

where the $\Delta CDCC$ term is defined as either the change in the naive value, as indicated by the V superscript, or the nuanced value, as indicated by the U superscript. Households are indexed by i and time is indexed by t. The dependent variable is generally child-care expenditure or percentage of income spent on child care, though we use other spending measures in robustness checks.

The $\Delta CDCC$ variables are calculated for households in both the pre- and post-expansion periods holding all household characteristics constant. For those households that we observe in 2000–2002, this variable measures how the CDCC value would change if they faced the post-expansion tax rules. The variable $Post$ is an indicator for the household being observed in 2003–2005. The coefficient on $Post$ interacted with $\Delta CDCC$ is the difference-in-differences estimate of the causal effect of the change in the value of the CDCC on the measure of spending.

The identification comes from the assumption that households observed in 2003–2005 would have had the same spending on average as those observed in 2000–2002 had it not been for the tax change. To control for differences in the composition of the samples in the pre- and post-expansion periods, we include a vector of observable characteristics, X, including family income, race of the parent(s), educational attainment of the parent(s), and number of children. To account for inflation and trending we include a set of year fixed effects (given by θ). Reduced tax rates and the increased value of the CTC means taxpayers in the post period had lower tax liability on average than those in the pre-2003 period. Year fixed effects should also account for this income effect. We also include month fixed effects to control for seasonal variation such as differences in child-care spending during the summer versus the school year.

We also estimate specifications in which the change in the value of the Child and Dependent Care Credit, $\Delta CDCC$, is replaced with ΔD, the change in the discount on the first dollar of child-care expenditure

$$(7) \quad E_{it} = \beta_0 + \beta_1\left(Post_t \times \Delta D_{it}^{V}\right) + \beta_2 \Delta D_{it}^{V} + \beta_3\left(Post_t \times \Delta D_{it}^{U}\right) + \beta_4 \Delta D_{it}^{U} + \gamma X_{it}$$
$$+ \theta_t + \varepsilon_{it}.$$

The naive change in the discount is indicated by the V superscript and the nuanced change is indicated by the U superscript. This alternative specification relies on the same identification assumptions, but allows us to estimate a response to a change in the after-tax price of child care rather than a change in the maximum credit value.

In both specifications, measurement error may impact both the naive and nuanced parameter estimates. The nuanced measure may contain more measurement error than the naive measure because the nuanced measure requires more information. In addition to attenuation bias from classical measurement error that may be present in both parameter estimates, correlation between the naive and nuanced measures could result in the coefficient estimate for the less noisy measure capturing some of the impact of the noisier measure. Such bias caused by the combination of measurement error and correlation between the naive and nuanced measures would make separating spotlighting behavior from fully-informed responses difficult. While naive and nuanced measures of the change in CDCC value have a sample correlation of –0.46, the measures of the change in child-care discount have a sample correlation of only –0.02.[17]

V. RESULTS

A. Evidence of Spotlighting

We find evidence of a large and statistically significant effect of the change in the *naive* value of the CDCC on child-care expenditure and find little evidence of any effect from the change in the *nuanced* value of the CDCC. These results are reported in Table 2 and are consistent with spotlighting behavior. In the first three columns the dependent variable is the dollar value of child-care expenditure during the two-week survey period. In the last three columns the dependent variable is the percentage of income spent on child care. While the specifications in columns (1) and (4) include an indicator for family type, we also estimate the models separately for married and single households.

Because the CDCC expansion was passed in 2001 and was advertised in 2002, it is possible that the response began before the 2003 implementation. If this is the case, our estimates of both the naive and the nuanced effect would be biased downward. It is also possible that the full effect of the CDCC expansion is realized with a lag as taxpayers realize that a change has taken place only when doing their taxes the next year. This would also cause a downward bias in our results. Therefore, Panel B of Table 2 reports results when the years 2002 and 2003 are excluded from the sample. This leaves us with a 2000–2001 pre-expansion period and a 2004–2005 post-expansion period from which to estimate the naive and nuanced effects. Estimates in Panel B of Table 2 are similar to those presented in Panel A.

Estimates of the parameter of interest for the naive change in the value of the CDCC are large and often statistically significant for both the full sample and the sample excluding

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[17] For both approaches, similar results can be obtained when running separate regressions for naive and nuanced measures, suggesting that multicollinearity is not making the estimates unstable.

Table 2

Effect of CDCC Value on Child-Care Expenditure

Panel A: Full Sample

| | Dollars of Two-Week Expenditure | | | Percent of Annual Income | | |
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**0.039****	**0.030**	**0.062*****	**0.005****	**0.003**	**0.008****
	(0.016)	**(0.027)**	**(0.024)**	**(0.002)**	**(0.003)**	**(0.004)**
Naive ΔCDCC	−0.023	0.019	−0.064	−0.003	0.003	−0.008
	(0.023)	(0.023)	(0.039)	(0.004)	(0.002)	(0.006)
Nuanced diff-in-diff	**0.010**	**0.002**	**0.019**	**0.002**	**0.000**	**0.003**
	(0.009)	**(0.012)**	**(0.016)**	**(0.001)**	**(0.001)**	**(0.002)**
Nuanced ΔCDCC	−0.004	0.003	−0.009	−0.001	0.000	−0.002
	(0.007)	(0.005)	(0.014)	(0.001)	(0.001)	(0.002)
Income ($1,000s)	0.020	0.483*	−0.204	−0.063	0.025	−0.116
	(0.304)	(0.256)	(0.482)	(0.051)	(0.027)	(0.083)
H_0: Naive = Nuanced	0.021	0.158	0.016	0.041	0.258	0.027
Observations	2,682	1,483	1,199	2,682	1,483	1,199
R^2	0.026	0.047	0.030	0.019	0.048	0.026

Table 2, Effect of CDCC Value on Child-Care Expenditure, Continued

	Panel B: Excluding Years 2002 and 2003					
	Dollars of Two-Week Expenditure			Percent of Annual Income		
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**0.050****	**0.076**	**0.042****	**0.006***	**0.008**	**0.004**
	(0.023)	**(0.047)**	**(0.021)**	**(0.003)**	**(0.006)**	**(0.003)**
Naive ΔCDCC	−0.005	0.024	−0.050	0.000	0.004	−0.004
	(0.020)	(0.032)	(0.040)	(0.002)	(0.003)	(0.003)
Nuanced diff-in-diff	**0.005**	**0.020**	**−0.005**	**0.001**	**0.003**	**0.000**
	(0.010)	**(0.020)**	**(0.014)**	**(0.001)**	**(0.002)**	**(0.001)**
Nuanced ΔCDCC	0.005	0.005	0.009	0.000	0.000	0.001
	(0.006)	(0.007)	(0.010)	(0.000)	(0.001)	(0.001)
Income ($1,000s)	0.310	0.522	0.211	−0.007	0.025	−0.027
	(0.190)	(0.383)	(0.301)	(0.023)	(0.043)	(0.038)
H_0: Naive = Nuanced	0.012	0.078	0.016	0.043	0.152	0.050
Observations	1,700	949	751	1,700	949	751
R^2	0.046	0.065	0.069	0.045	0.077	0.053

Notes: All specifications include month and year fixed effects as well as indicators for the race of the parent(s), family type, number of young children, and the presence of a child age 13 or more (potential babysitting by sibling). The data only include households with young (under age 13) children and an annual income between $10,000 and $50,000. Both parents must earn income in two-parent households to be included in the data. Child-care expenditure as a percentage of annual income is calculated as 26 times the reported two-week child-care expenditure divided by annual income and multiplied by 100. P-values from Wald tests for the equality of Naive and Nuanced difference-in-differences estimates are reported. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

the years 2002 and 2003. Because the dependent variable in columns (1) through (3) is measured over a two-week period, an annual interpretation requires multiplying by 26. For example, the coefficient estimate of 0.039 implies that a one dollar increase in the naive value of the CDCC causes a $1.01 (0.039 × 26) increase in annual child-care expenditure with a 95 percent confidence interval of ($0.20, $1.83). Multiplying by 26 may not be appropriate if households pay for child-care expenses monthly rather than every two weeks. If all households are reporting monthly expenditures paid during that two-week period, the coefficient estimate of 0.039 implies that a one dollar increase in the naive value of the CDCC causes a $0.47 (0.039 × 12) increase in annual child-care expenditure with a 95 percent confidence interval of ($0.09, $0.84).

One possible explanation for the large magnitude of the estimated response is that workers may choose from a limited number of options for hours of work.[18] When workers face such labor supply constraints, even a slight increase in naive child-care subsidy rates could persuade marginal families to make a large discrete change in both work hours and child-care expenditure. Average child-care expenditure may increase if lumpy adjustments exceed non-adjustments among households unable to make continuous consumption choices.

Estimates of the effect of the nuanced change in the value of the CDCC on child-care expenditure are not statistically different than zero. Importantly, in most specifications, we are able to reject the hypothesis that the naive and nuanced parameters are equal (p-value reported for each specification). We interpret the results as providing strong evidence of an effect of the change in the naive value of the CDCC on child-care expenditure and no evidence of an effect of the change in the nuanced value of the CDCC.

This result is illustrated in Figure 6 that plots the average child-care expenditure as a percentage of income by year for four groups of taxpayers (not mutually exclusive groups). In Panel A, the dashed line plots average child-care expenditure for taxpayers with a larger than median change in the naive value of the CDCC and the solid line is for those taxpayers with a smaller than median change in the naive value of the CDCC. Panel B is similar in that it groups taxpayers by the change in the nuanced value of the CDCC. The econometric model is not used in creating the figure as it simply reports the average child-care expenditure as a percentage of income for the different groups.

Figure 6 suggests that those with a large increase in the naive value of the CDCC increased their child-care expenditure, while those with a large increase in the nuanced value of the CDCC did not increase their spending on child care.[19] The increase in child-care expenditure for those with an above median naive CDCC change may seem

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[18] As discussed by Altonji and Paxson (1988) and Dickens and Lundberg (1993). Golden (2001) notes female, non-white, and less educated workers (a group targeted by the CDCC expansion) are less likely to have flexible work schedules.

[19] Indeed, households with changes in naive values above the 75th percentile spent 16.6 percent more in post-expansion period than households with changes in naive values below the 25th percentile (p-value = 0.057).

Figure 6

Average Child-care Expenditure by Year

(A) Naive Change in Discount on Child Care

(B) By Nuanced CDCC Change
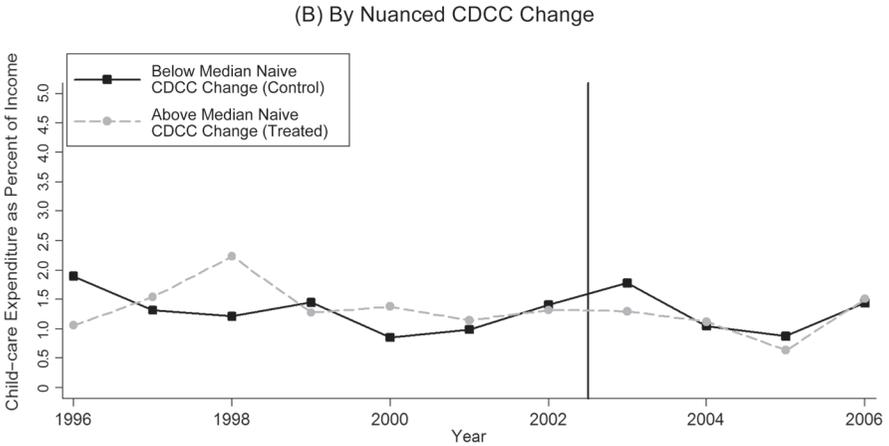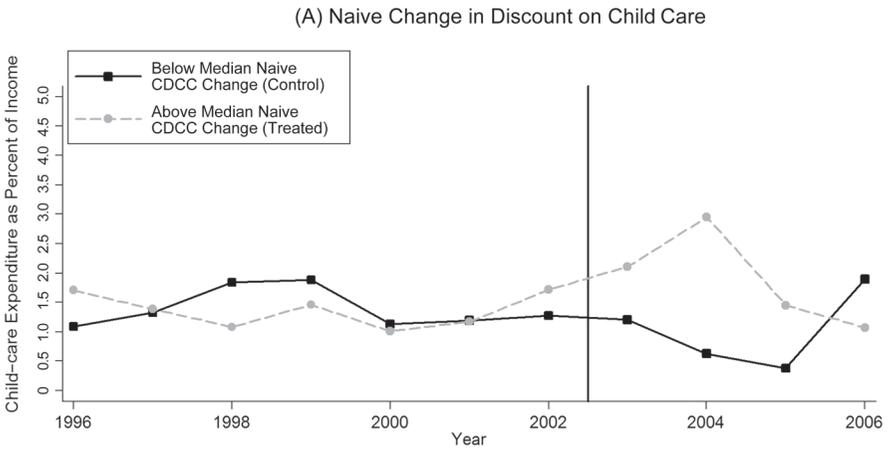
Notes: Panel A and Panel B plot the average child care expenditure as a percentage of income by year for CES households with income between $10,000 and $50,000 for two groups. The treated group is defined as those individuals with an above median change in naive or nuanced value of the CDCC. The control group is defined as those individuals with a below median change in naive or nuanced value of the CDCC. Households with a very large or small (top or bottom 5 percent) change (defined separately for each panel) are excluded.

to have begun even before the implementation of the CDCC expansion (indicated in the figure by the vertical line). This could simply be normal variation in the series or it could be a response in advance of the implementation given that the CDCC expansion was passed in 2001. The decline in child-care expenditure in 2005 for those with an above-median change in the naive value of the CDCC may indicate that spotlighting is a temporary behavior for some taxpayers as they recognize that the benefits of the CDCC are smaller than expected. Consistent with the regression results from Table 2, there is no corresponding increase in child-care expenditure for those with an above-median change in the nuanced value of the CDCC. Importantly, there are no obvious differences in child-care expenditure for the different groups before 2003.

Table 3 reports the estimated effect of an increase in the first-dollar discount as specified in (8). The magnitudes reported in Panel A of Table 3 are similar to those reported in Panel A of Table 2, although the estimates are noisier. The coefficient estimate of 1.909 suggests that each additional cent per dollar decrease in the naive marginal price of child care causes expenditures to increase by $49.63 (1.909 × 26) per year, with a 95 percent confidence interval of (–$1.68, $100.95). Recall the average household with child-care expenditure spends $3,796 per year on child care ($146 × 26), so a cent per dollar decrease in the price of child care saves it almost $38. Hence Table 3 reports that a $1 "naive" increase in government expenditure causes a $1.31 (49.63/38) increase in annual child-care expenditure for this average household, with a 95 percent confidence interval of (–$0.04, $2.66). This is very similar to the $1.01 estimate reported in Table 2. If all households are reporting monthly expenditures paid during the two-week period, this suggests an increase in child-care expenditure of $22.91 per year (1.90 × 12), with a 95 percent confidence interval of (–$0.78, $46.59). This would imply a $1 naive increase in government expenditure causes a $0.60 (22.91/38) increase in annual child care expenditure, with a 95 percent confidence interval of (–$0.02, $1.23).

The responses to naive and nuanced measures of the marginal price of child care are not statistically different for the full sample in Panel A of Table 3. Panel B excludes the year immediately before and the year immediately after the expansion. Estimates of the naive effect in Panel B are statistically significant and larger than responses to nuanced estimates, consistent with concerns about downward bias. In both panels, there remains no evidence that the nuanced change in the first-dollar discount has any effect on child-care expenditure.

Because available data do not pair expenditure on child care with a measure of the quantity or quality of child care, we do not know whether increased expenditures on the intensive margin reflects a larger quantity of child care or higher quality child care. It is possible to gain some insight about adjustment along the extensive margin by replacing the dependent variable with a dummy for non-zero child-care expenditure. Panel A of Table 4 shows there is little response by any group to the naive or nuanced maximum

Table 3

Effect of Child-Care Discount on Child-Care Expenditure

Panel A: Full Sample

	Dollars of Two-Week Expenditure			Percent of Annual Income		
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**1.909***	**2.011**	**3.786***	**0.127**	**0.187**	**0.177**
	(1.007)	**(1.237)**	**(1.982)**	**(0.123)**	**(0.130)**	**(0.229)**
Naive Δ Discount	−0.435	−0.237	−1.655	−0.004	0.017	−0.013
	(0.945)	(0.797)	(2.357)	(0.141)	(0.069)	(0.356)
Nuanced diff-in-diff	**0.879**	**−0.142**	**1.780**	**0.145**	**−0.023**	**0.311**
	(0.830)	**(0.308)**	**(1.711)**	**(0.147)**	**(0.036)**	**(0.305)**
Nuanced Δ Discount	−0.752	0.055	−1.597	−0.136	0.011	−0.292
	(0.870)	(0.140)	(1.795)	(0.156)	(0.014)	(0.321)
Income ($1,000s)	0.226	0.254	0.274	−0.033	−0.009	−0.041
	(0.161)	(0.208)	(0.238)	(0.026)	(0.024)	(0.042)
H_0: Naive = Nuanced	0.512	0.105	0.528	0.940	0.152	0.791
Observations	2,682	1,483	1,199	2,682	1,483	1,199
R^2	0.028	0.047	0.038	0.023	0.045	0.036

Table 3, Continued

	Dollars of Two-Week Expenditure			Percent of Annual Income		
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**3.661*** **	**4.249** **	**5.890*** **	**0.299*** **	**0.383* **	**0.418*** **
	(1.118)	**(1.890)**	**(2.049)**	**(0.113)**	**(0.222)**	**(0.152)**
Naive Δ Discount	−0.804	0.186	−3.651*	−0.080	0.050	−0.335*
	(0.914)	(1.002)	(1.964)	(0.108)	(0.091)	(0.193)
Nuanced diff-in-diff	**0.052**	**−0.820**	**0.217**	**−0.001**	**−0.099**	**0.021**
	(0.236)	**(0.609)**	**(0.286)**	**(0.025)**	**(0.071)**	**(0.029)**
Nuanced Δ Discount	0.133	0.214	0.129	0.024**	0.030	0.026
	(0.123)	(0.190)	(0.182)	(0.012)	(0.019)	(0.020)
Income ($1,000s)	0.348*	0.380	0.414	−0.023	−0.002	−0.029
	(0.208)	(0.271)	(0.287)	(0.031)	(0.031)	(0.046)
H_0: Naive = Nuanced	0.001	0.024	0.005	0.010	0.076	0.007
Observations	1,700	949	751	1,700	949	751
R^2	0.047	0.063	0.080	0.041	0.070	0.056

Notes: All specifications include month and year fixed effects as well as indicators for the race of the parent(s), education of the parents(s), family type, number of young children, and the presence of a child age 13 or more (potential babysitting by sibling). The data only include households with young (under age 13) children and an annual income between $10,000 and $50,000. Both parents must earn income in two-parent households to be included in the data. Child-care expenditure as a percentage of annual income is calculated as 26 times the reported two-week child-care expenditure divided by annual income and multiplied by 100. P-values from Wald tests for the difference between Naive and Nuanced difference-in-differences estimates are reported. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table 4
Effect on Extensive Margin

Panel A: Maximum Value of CDCC

	Full Sample			Excluding Years 2002 and 2003		
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**0.003**	**−0.009**	**0.015**	**0.009**	**−0.002**	**0.021**
	(0.008)	**(0.010)**	**(0.013)**	**(0.010)**	**(0.013)**	**(0.015)**
Naive Δ discount	0.002	0.005	−0.019	−0.001	0.003	−0.034
	(0.011)	(0.015)	(0.019)	(0.013)	(0.019)	(0.023)
Nuanced diff-in-diff	**0.000**	**−0.003**	**−0.003**	**0.001**	**0.002**	**−0.006**
	(0.005)	**(0.007)**	**(0.008)**	**(0.007)**	**(0.010)**	**(0.009)**
Nuanced Δ discount	−0.001	−0.008*	0.010*	0.001	−0.005	0.011*
	(0.004)	(0.005)	(0.006)	(0.004)	(0.006)	(0.006)
Income ($1,000s)	0.204*	0.281	0.007	0.156	0.171	−0.077
	(0.119)	(0.180)	(0.178)	(0.150)	(0.247)	(0.230)
H_0: Naive = Nuanced	0.699	0.514	0.114	0.380	0.716	0.065
Observations	2,249	1,222	1,027	1,430	781	649
R^2	0.046	0.056	0.062	0.049	0.055	0.073

Table 4, Continued

	Panel B: First-Dollar Margin Price of Child Care					
	Full Sample			Excluding Years 2002 and 2003		
	All	Married	Single	All	Married	Single
	(1)	(2)	(3)	(4)	(5)	(6)
Naive diff-in-diff	**0.505**	**−0.035**	**2.279****	**0.963**	**0.524**	**2.580****
	(0.499)	**(0.646)**	**(0.929)**	**(0.593)**	**(0.826)**	**(1.103)**
Naive Δ discount	−0.150	0.987	−1.919**	−0.215	1.158	−2.381**
	(0.516)	(0.629)	(0.912)	(0.628)	(0.790)	(1.071)
Nuanced diff-in-diff	**0.068**	**−0.039**	**0.049**	**−0.060**	**−0.453**	**0.084**
	(0.166)	**(0.354)**	**(0.170)**	**(0.201)**	**(0.537)**	**(0.178)**
Nuanced Δ discount	0.007	−0.242	0.196	0.187**	0.063	0.263**
	(0.111)	(0.190)	(0.127)	(0.091)	(0.163)	(0.109)
Income ($1,000s)	0.177	0.425***	0.022	0.167	0.426*	−0.004
	(0.117)	(0.159)	(0.159)	(0.153)	(0.227)	(0.207)
H_0: Naive = Nuanced	0.398	0.996	0.014	0.093	0.373	0.019
Observations	2,249	1,222	1,027	1,430	781	649
R^2	0.047	0.054	0.066	0.052	0.058	0.079

Notes: All specifications include month and year fixed effects as well as indicators for the race of the parent(s), education of the parent(s), family type, number of young children, and the presence of a child age 13 or more (potential babysitting by sibling). The data only include households with young (under age 13) children and an annual income between $10,000 and $50,000. Both parents must earn income in two-parent households to be included in the data. The dependent variable is an indicator for non-zero child-care expenditure and is multiplied by 100. P-values from Wald tests for the difference between Naive and Nuanced difference-in-differences estimates are reported. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

value of the CDCC. This is unsurprising, since the maximum value of the CDCC is unlikely to be the binding constraint for the first-dollar consumption of child care. The first-dollar discount more accurately reflects the binding constraint at the point of consumption for this group. Panel B of Table 4 shows the full sample of single parents in particular were 2.3 percent more likely to have non-zero child-care expenditure for each additional cent per dollar increase in the naive first-dollar discount on child care, with a 95 percent confidence interval of (0.5 percent, 4.1 percent). Similar estimates are obtained when excluding 2002 and 2003. For single parents, the response to the naive first-dollar discount is significantly larger than the response to the nuanced first-dollar discount. Again, we find no evidence that any group responded to the nuanced first-dollar discount.

B. Falsification Exercises

We perform two falsification exercises. The first is designed to see if the naive CDCC expansion had any effect on expenditure for other goods. The second is designed to see if we find similar results when we apply the same methods to a sample of households that were all in the pre-expansion period. We present results for both tests for only the change in value of the CDCC; using discounts to marginal price provides similar results.

If the change in the child-care subsidy affects expenditure on other unrelated goods it would raise concern about the causal interpretation. We examine expenditure on baby-sitting, nondurables, and all eleven generic aggregations as defined by the CES (food, alcoholic beverages, fuel, etc.). Table 5 reports the difference-in-differences estimates from estimating the same specification as reported in Table 2 columns (1) and (4) of Panel A where only the dependent variable is changed. There is little evidence that changes in the naive or the nuanced value of the CDCC affected expenditure. This suggests the causal effect on child-care expenditure is not simply capturing an income effect.[20]

Our second falsification exercise uses an additional sample of households from 1996 to 1999. In this exercise we assume that a hypothetical change in the value of the CDCC occurs at the beginning of 1999. The households observed in 1999–2001 are "treated" while those in 1996–1998 are the "control" group. Our measures of the naive and nuanced change in the value of the CDCC are still calculated by comparing the 2001 to the 2005 tax code, even though we are only using pre-expansion data. If a statistically significant response in child-care spending is found, such a false positive would raise concern about the causal interpretation of our main results. Table 6 reports no statistically significant response in child-care spending to this hypothetical treatment, which increases our confidence in the main results.

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[20] Several papers, including Johnson, Parker, and Souleles (2006), Shapiro and Slemrod (2003), and Agarwal, Liu, and Souleles (2007), have addressed how households respond to a sudden decrease in tax liability (like the sudden increase in the Child Tax Credit in 2003). They focus on what fraction of a tax rebate is spent rather than saved and find that households typically spend about 60 percent within the next year.

Table 5
Effect on Other Expenditure

Expenditure Category	Dollars of Two-Week Expenditure			Percent of Annual Income		
	Naive diff-in-diff	Nuanced diff-in-diff	H_0: Naive = Nuanced	Naive diff-in-diff	Nuanced diff-in-diff	H_0: Naive = Nuanced
Babysitting	−0.003 (0.011)	−0.005 (0.005)	0.793	−0.000 (0.001)	−0.000 (0.001)	0.851
Nondurables	−0.053 (0.065)	−0.046 (0.048)	0.902	0.000 (0.008)	−0.005 (0.005)	0.462
Food	−0.044 (0.031)	−0.031 (0.023)	0.663	−0.005 (0.004)	−0.004* (0.002)	0.753
Alcohol	−0.005 (0.005)	0.001 (0.003)	0.242	−0.000 (0.001)	0.000 (0.000)	0.553
Fuel	−0.007 (0.036)	−0.008 (0.025)	0.988	0.002 (0.004)	−0.001 (0.002)	0.501
Household supplies	−0.010 (0.006)	−0.002 (0.005)	0.139	−0.001 (0.001)	−0.000 (0.001)	0.253
Household furnishings	−0.007 (0.041)	0.035 (0.037)	0.331	−0.001 (0.004)	0.003 (0.003)	0.208
Apparel	−0.032 (0.030)	−0.023 (0.023)	0.742	−0.005 (0.004)	−0.002 (0.003)	0.479

Table 5, Effect on Other Expenditure, Continued

Expenditure Category	Dollars of Two-Week Expenditure			Percent of Annual Income		
	Naive diff-in-diff	Nuanced diff-in-diff	H_0: Naive = Nuanced	Naive diff-in-diff	Nuanced diff-in-diff	H_0: Naive = Nuanced
Gasoline and motor oil	0.002	−0.003	0.635	0.002*	−0.000	0.024
	(0.011)	(0.008)		(0.001)	(0.001)	
Medical supplies	0.005	0.004	0.784	0.001	0.000	0.910
	(0.006)	(0.003)		(0.001)	(0.000)	
Entertainment	0.037	0.000	0.170	0.006	0.001	0.121
	(0.030)	(0.018)		(0.004)	(0.002)	
Personal care	−0.005	−0.001	0.568	−0.001	−0.000	0.649
	(0.006)	(0.004)		(0.001)	(0.000)	
Miscellaneous	−0.034	0.040	0.051	−0.002	0.004	0.058
	(0.022)	(0.029)		(0.002)	(0.003)	

Notes: All specifications are identical to the main results and include month and year fixed effects as well as indicators for the race of the parent(s), education of the parent(s), family type, number of young children, and the presence of a child age 13 or more (potential babysitting by sibling). The data only includes households with young (under age 13) children and an annual income between $10,000 and $50,000 over the full sample of years 2000–2005. Both parents must earn income in two-parent households to be included in the data. Child-care expenditure as a percentage of annual income is calculated as 26 times the reported two-week child-care expenditure divided by annual income and multiplied by 100. P-values from Wald tests for the difference between Naive and Nuanced diff-in-diff estimates are reported. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

Table 6
Falsification Exercise
(1996–2001 data)

	Dollars of Two-Week Expenditure			Percent of Annual Income		
	All	Married	Single	All	Married	Single
Child-care Expenditure	(1)	(2)	(1)	(2)	(1)	(2)
Naive diff-in-diff	**−0.006**	**−0.002**	**0.011**	**0.000**	**0.001**	**0.002**
	(0.010)	**(0.012)**	**(0.020)**	**(0.001)**	**(0.001)**	**(0.002)**
Naive ΔCDCC	−0.007	−0.013	−0.027	−0.002	−0.002	−0.005
	(0.017)	(0.018)	(0.037)	(0.002)	(0.002)	(0.004)
Nuanced diff-in-diff	**−0.002**	**0.003**	**−0.010**	**0.000**	**0.000**	**−0.000**
	(0.007)	**(0.008)**	**(0.013)**	**(0.001)**	**(0.001)**	**(0.001)**
Nuanced ΔCDCC	0.009	0.005	0.015	0.000	0.000	0.001
	(0.006)	(0.006)	(0.011)	(0.001)	(0.001)	(0.001)
Income ($1,000s)	0.201	0.032	0.297	−0.045*	−0.035	−0.066
	(0.200)	(0.224)	(0.357)	(0.026)	(0.025)	(0.049)
H_0: Naive = Nuanced	0.744	0.651	0.332	0.784	0.801	0.217
Observations	2,989	1,914	1,076	2,989	1,914	1,076
R^2	0.033	0.042	0.062	0.026	0.035	0.046

Notes: All specifications include month and year fixed effects as well as indicators for the race of the parent(s), education of the parents(s), family type, number of young children, and the presence of a child age 13 or more (babysitter). The data only includes households with young (under age 13) children and an annual income between $10,000 and $50,000. Both parents must earn income in two-parent households to be included in the data. Child-care expenditure as a percentage of annual income is calculated as 26 times the reported two-week child-care expenditure divided by annual income and multiplied by 100. P-values from Wald tests for the difference between Naive and Nuanced diff-in-diff estimates are reported. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) levels.

VI. CONCLUSION

This paper examines how consumers respond to a change in a personal income tax provision when interactions with other elements of the tax code obfuscate the true impact of the changed provision. We use data from the Consumer Expenditure Survey to provide evidence that taxpayers engage in spotlighting behavior — they respond to the change in the particular tax provision in isolation without considering the interactions with other parts of the tax code. The evidence comes from our examination of the 2003 change to the Child and Dependent Care Credit (CDCC) which spotlighting taxpayers would have perceived as reducing the after-tax price of child care. However, interactions with other elements of the tax code, including the simultaneous change to the Child Tax Credit, reduced or even reversed this decrease in the after-tax price of child care for some taxpayers.

Using household data, we employ a difference-in-differences strategy that exploits the heterogeneity in the size of naive and nuanced measures of the change in value of the CDCC. We find strong evidence of a child-care expenditure response to the *naive* measure of the change in the value of the CDCC, which does not consider interactions with other elements of the tax code. We find little evidence of any response to the *nuanced* measure, which does account for interactions with other elements of the tax code. Similar results are found exploiting heterogeneity in the naive and nuanced marginal price of child care. Falsification exercises find little evidence the CDCC expansion (either naive or nuanced) affected expenditure on other goods. We also find no evidence of a response to a hypothetical CDCC expansion using pre-expansion data. We interpret these results as evidence that taxpayers were engaged in spotlighting behavior.

This paper supplements the existing tax salience literature by showing taxpayers can misperceive after-tax prices due to important but low-salience interactions, even when the direct financial implications are salient. Tax preparation software may reinforce spotlighting in some instances by focusing attention on each deduction or credit in isolation rather than on how different economic behavior affects final tax liability. This issue applies to any tax interactions that taxpayers may ignore, including other non-refundable tax credits, deductions and credits with phase-outs, and credits with income eligibility requirements.

Because available data do not pair expenditure on child care with a measure of the quantity or quality of child care, we do not always know whether increased expenditures reflect a larger quantity of child care or higher quality child care. There is some evidence that decreases in the naive measures of the marginal price of child induced single parents to begin consuming child care, and this may have increased female labor force participation rates.

Despite any influence the naive measure of the CDCC had on taxpayers' child-care expenditures and labor decisions, the government did not bear the cost associated with the naive value of the CDCC. Instead, the government bore the cost of the nuanced value which in our sample of low-income families with children was just 47 percent of what the government would have born had they paid the full cost associated with the naive

value. Our results indicate that taxpayers significantly increased their expenditure on child care in response to the 2003 expansion of the CDCC, regardless of whether their after-tax price of child care decreased or increased.

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