The Response of Consumer Spending to Rebates During an Expansion: Evidence from the 2003 Child Tax Credit*

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April 2009

Abstract: In the summer of 2003, the US government mailed around $14 billion in child tax credit payments to millions of households. Using special questions added to the Consumer Expenditure Survey, we estimate the change in consumption expenditures caused by receipt of these payments, by comparing the spending of households that receive payments in a given period to the spending of those that do not. On average, households spent about a quarter of their payments on nondurable consumption goods during the three-month period in which the payments were received. There is also less precisely estimated evidence of an ongoing but smaller response in the subsequent three-month period, so that roughly one-third of the payment was spent cumulatively during the quarter of receipt and subsequent three-month period. These responses are larger for households with relatively low liquid wealth or low income, which is consistent with their facing binding liquidity constraints.

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In July and August of 2003, as a result of the Jobs and Growth and Tax Relief Reconciliation Act (JGTRRA), about 25 million U.S. households were mailed child tax credit payments of $400 per qualifying dependent, in aggregate amounting to about $14 billion. In this paper we measure the extent to which households spent these payments when they arrived, by comparing the spending of households receiving payments at a given time to the spending of households not receiving payments at that time. We use the Consumer Expenditure (CE) Survey, which contains comprehensive measures of household-level expenditure for a stratified random sample of U.S. households, coupled with information from a special module of questions about the tax credits that we and the staffs of the Bureau of Labor Statistics (BLS) and other government agencies worked to add to the CE survey. This module asked CE households to report the amount and month of arrival of each child tax credit payment they received.

Because the 2003 payments differ from other recent national rebate-type tax programs, such as the 2001 income tax rebates, the results provide some evidence about the stability of spending responses across rebate-type payments and the theoretical reasons underlying the spending responses. While there are numerous differences across the 2003 and 2001 payments, there are two in particular that might be potentially important for the spending response. First, unlike in 2001, the 2003 payments were distributed not while a recession appeared to be underway or imminent, but instead during a time of economic growth, albeit with a weak labor market. Second, although the child tax credit was previously slated to increase in steps over many years, the legislative change that led to the 2003 payments merely increased the credit for two years, and so represents a more transitory tax cut than the 2001 rebates, which represented the first installment of a 10-year tax cut.[1]

Summarizing our main findings, comparing households that receive a child tax credit payment in a given period to those that do not, the average household spent about a quarter of its payment on nondurable goods during the three-month period in which the payment was received. This response is statistically and economically significant. We also find evidence of additional, smaller and less precisely estimated, lagged effects on spending, so that roughly one-third of the

[1] That is, the tax cut underlying the 2001 rebate – the reduction in the tax rate applied to income in the lowest tax bracket – was legislated to last 10 years.

child tax credit payment was spent cumulatively during the quarter of receipt and subsequent three-month period.

Although these findings do not depend on any particular theoretical model, they are inconsistent with the canonical life-cycle/permanent income hypothesis (LCPIH). To shed further light on the reasons behind the estimated average response of spending, we estimate the extent to which the responses differ across different types of households and across different subcategories of nondurable goods. Across households, the response comes disproportionately from the spending of households with low levels of liquid assets or low income. This result is consistent with an important role for liquidity constraints. Across goods, the response comes disproportionately from spending on apparel. This result could reflect either a relatively large intertemporal elasticity of substitution (IES) for apparel, or sampling error due to the greater volatility of measured spending in subcategories of goods. The result could also potentially reflect other confounding differences between households that received the child tax credit and households that did not, such as different patterns of seasonal variation due to the presence of children.[2] However, we find that spending on apparel for children accounts for only a minority of the spending response of all apparel, and only about one-third of the total response of nondurable goods to the child credit. Also, supportive of a causal interpretation of our main estimates, disproportionately large responses of apparel have been found elsewhere in response to other payments not directly related to children, for example in Johnson, Parker, and Souleles (2006) (JPS) and Parker (1999).

Compared to the spending response to the 2001 rebates found in JPS, the point estimates here are generally smaller and less precisely estimated. Although not statistically different, the point estimates of the contemporaneous effect in 2003 are about 60 percent of those estimated for 2001 in similar specifications, and the estimates of the cumulative effect are about 45 percent as large. The lower precision likely stems from the smaller sample of treated households and the more limited temporal variation in receipt. Yet overall the qualitative pattern of results is generally similar. In particular, in both 2001 and 2003 the largest responses come from liquidity-constrained households. Our results thus suggest both some stability in the underlying mechanism explaining the aggregate response to rebate-type tax payments, and a more potent

[2] As discussed below, while the timing of the receipt of the payment was randomized, unlike in 2001 the random timing variation in 2003 is too limited to be used alone to identify the spending effect.

response to such payments in recessions, when liquidity constraints are more likely to bind, than during times of more typical economic growth. One important caveat to these conclusions, however, is that the responses in 2001 and 2003 are necessarily estimated using a somewhat different mix of variation.

This paper is structured as follows. Sections I and II briefly describe the literature and relevant aspects of the 2003 Tax Act. Section III describes the data and Section IV sets forth our empirical methodology. Section V presents the main results regarding the short-run response to the child credit payments, while Section VI examines the longer-run response. Section VII examines differences in the response across different households and consumption goods, and a final section concludes. The Appendix contains additional information about the data.

I. Related Literature

There is a large literature that tests the consumption-smoothing implications of the rational-expectations LCPIH. This paper is closely related both to the literature that uses household-level data and quasi-experiments to identify the effects of changes in household income,[3] and to the smaller literature that estimates the effects of changes in tax policy on consumption.[4]

Several recent studies of the 2001 income tax rebates are particularly relevant. JPS use a module of questions appended to the CE survey in 2001, similar to the module in 2003 used here, and exploit the fact that the timing of the mailing of the rebates was randomized across households. They find that households spent about 20-40 percent of their rebates on nondurable goods during the three-month period in which they received their rebates. There is also a significant lagged spending effect, so that roughly two-thirds of the rebates were spent cumulatively during the quarter of receipt and subsequent three-month period. The responses are largest for households with low liquid wealth or low income, consistent with binding liquidity

[3] See Deaton (1992), Browning and Lusardi (1996), and JPS for reviews.

[4] Most early studies, such as Modigliani and Steindel (1977), Blinder (1981), Poterba (1988), Blinder and Deaton (1985), and Wilcox (1989, 2000), use aggregate expenditure data. However, time-series analysis of such data is hampered by the limited number of substantial changes in tax policy. Using instead household-level data, Souleles (1999) finds that spending responds significantly to the Federal income tax refunds that most taxpayers receive each spring. Parker (1999) finds that spending responds significantly to changes in take-home pay that occur for high-income households that hit the Social Security tax cap. Hsieh (2003) finds that the spending of Alaskans responds more to their Federal income tax refunds than to the annual payments they receive from the Alaska Permanent (Oil) Fund. Other related studies include Browning and Collado (2001), Shapiro and Slemrod (1995), Souleles (1999, 2000, 2002), and Stephens (2003, 2005, 2006). See also the earlier studies by Bodkin (1959) and Kreinin (1961).

constraints. Agarwal, Liu, and Souleles (2007) finds qualitatively similar results using credit card account data: in particular, a significant lagged spending effect, which is strongest among credit-constrained households.

In addition, Shapiro and Slemrod (2003a) find, using the Michigan Survey of Consumers, that about 22% of respondents who received (or expected to receive) a 2001 rebate report that they will mostly spend their rebate. The authors calculate that, under certain assumptions, this result implies an average marginal propensity to consume (MPC) of about one third, which is consistent with the short-run response of expenditure in JPS estimated from data on actual spending and rebate receipt. However, the Michigan survey results provide no evidence that liquidity constraints play a role in this response, and no evidence of a significant lagged effect on expenditure.[5]

Coronado, Lupton, and Sheiner (2006) analyze similar questions in the Michigan survey regarding the 2003 child tax credit payments and find that 24% of respondents who received the payment report that they will mostly spend it.[6] This response is slightly larger than that for the 2001 rebates, even though the 2003 payments represented a more transitory tax cut. Using a different calculation method than Shapiro and Slemrod (2003a), the authors estimate the resulting average MPC to be about a one fourth, which although smaller than the estimate in Shapiro and Slemrod, is still much larger than the MPC implied by the LCPIH for a transitory tax cut. The survey results provide no evidence of liquidity constraints.

II. The 2003 Child Tax Credit Payments

The Child Tax Credit, which was enacted in 1997, is the largest Federal cash assistance program for children, providing about $46 billion of subsidies per year.[7] The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) gradually increased the credit from $500

[5] Of the 78% of respondents who report they will mostly save their rebate, the majority (about three-fifths) report that they will mostly pay down debt (as opposed to accumulate assets). Shapiro and Slemrod (2003b) use a novel follow-up survey in 2002 to try to determine whether there was a lagged response to the rebate. They find that, of respondents who said they initially mostly used the rebate to pay down debt, most report that they will "try to keep [down their] lower debt for at least a year." They find similar results for those who report they will save by accumulating assets.

[6] 49% of the payment recipients report they will mostly pay down debt, and 27% report they will mostly save their payment (by accumulating assets). Using a follow-up question asking about additional spending "within a year", the spending response increases to 30% of respondents mostly spending the payment.

[7] For a review of the credit, see Burman and Wheaton (2005). The credit phases in and then phases out as income increases. Burman and Wheaton estimate that most of the benefits go to families with income between $20 thousand and $200 thousand.

per qualifying dependent in 2000, to $1000 in 2010, according to the following schedule: $600 in 2001-04, $700 in 2005-08, $900 in 2009, and $1000 in 2010. The credit was scheduled to "sunset" back to $500 in 2011.[8]

JGTRRA, enacted in May 2003, increased the credit for 2003 and 2004 only, from $600 to $1000. Subsequently the credit was scheduled to return to the levels established by the 2001 Act (i.e., to $700 in 2005). For 2003, the $400 increase in the credit was paid in advance, based on the credit claimed on taxpayers' 2002 tax returns. These payments were disbursed via checks mailed in the summer of 2003. As with the 2001 tax rebates, due to the scale of the mailing, the timing of the mailing was determined by the last two digits of the tax filer's Social Security number (SSN). These numbers are sequentially assigned (within groups) as individuals apply for an SSN, and so are effectively randomly determined for our purposes. Unlike the 2001 tax rebates, which were mailed over a ten-week period, the child tax credit payments were mailed over just three weeks, from July 25 to August 8, 2003.[9] The total payments in 2003 due to the expanded child credit were estimated to amount to about $14 billion (Joint Committee on Taxation [JTC], 2003). As for the increased 2004 credit, it was not mailed, but instead was treated like previous credits and claimed on the tax returns filed in the spring of 2005.[10]

JGTRRA included additional tax cuts, such as accelerated reductions in personal income tax rates and reductions in capital gains and dividend tax rates.[11] This paper focuses on the child credit checks disbursed in 2003, as recorded in our CE dataset.[12]

[8] The 2001 Act made additional changes to the child credit, such as expanding its refundability. It also enacted many other reductions in Federal personal and estate tax rates. For more details about the Act, see Alan J. Auerbach (2002) and Donald Kiefer et al. (2002).

[9] Taxpayers that filed their 2002 return late could have been mailed their payment after August 8, 2003. Since 92 percent of taxpayers typically file at or before the normal April 15th deadline (Slemrod et al., 1997)), this source of variation is small. Households with new qualifying dependents in 2003 (e.g., due to births) did not receive payments in 2003 but instead applied the resulting increase in their 2003 credit to their tax returns in the spring of 2004.

[10] Since taxpayers could reduce their withholding in anticipation of the 2004 credit, some of its proceeds could have been received in 2004. The JTC (2003) estimated that the total payments in 2004 and 2005 due to the expanded child credit under JGTRRA would amount to about $5 billion and $13 billion, respectively.

[11] The total reduction in tax revenues was estimated to amount to about $350 billion over 10 years. For a review of JGTRRA, see CCH (2003).

[12] Our empirical approach focuses on consumers' response to the receipt of their child credit payments, a point in time that we can precisely identify. Our methodology cannot estimate the magnitude of any earlier response that may have occurred in anticipation of the payments, both because the passage of the Tax Act cannot be separated from other aggregate effects captured by our time dummies, such as seasonality, and because there is no single point in time at which a tax cut went from being entirely unexpected to being entirely expected.

III. The Consumer Expenditure Survey

The CE interview survey contains detailed measures of the expenditures of a stratified random sample of U.S. households. CE households are interviewed up to four times, three months apart, to collect expenditure information. In each interview households report their expenditures during the preceding three months. New households are added to the survey every month so that the data are effectively monthly in frequency. In addition to surveying households about their expenditures, the CE also gathers (less-frequent) information about their demographic characteristics, income, and wealth.

The module about the 2003 child tax credit payments was included in the CE Survey in interviews conducted in September, October, and November of 2003. The module asked households whether they received an "advance payment check for the Child Tax Credit," and if so, the amount of each check and the date it was received. The survey instrument allows for up to three checks per household. The questions were written so as to be consistent with the style of other CE questions. Appendix A contains the language of the survey instrument. We follow JPS in constructing the total payments received by each household in each three-month expenditure reference-period and in measuring the household's expenditures.

Specifically, we focus on three different aggregated measures of consumption expenditures. First, we study expenditures on food, which include food consumed away from home, food consumed at home, and purchases of alcoholic beverages. Much previous research has studied such expenditure on food, largely because of its availability in the Panel Study of Income Dynamics, but it is a narrow measure of expenditure. Our second and main measure of consumption expenditures is nondurable expenditures, which is a broad measure of expenditures on nondurable goods and services, following previous research. We also consider a subset of nondurable expenditures, "strictly nondurable" expenditures, which excludes semi-durable goods like apparel, following Lusardi (1996). Appendix B provides further details about the data.

We also investigated total expenditures, including durable expenditures like auto and truck purchases. However, as in JPS, the response of total expenditures to the child payments was not statistically significant in our baseline specification. This seems likely due to the fact that the payments are small relative to the cost of autos and trucks and, more importantly, including expenditures on durable goods dramatically increases the variability of the dependent

variable and decreases precision in estimation. Thus, in keeping with earlier research, we focus on nondurable expenditures.[13]

Our baseline sample period starts with interviews in March 2003 (when period $t+1$ in equation (1) below covers expenditures in December 2002 to February 2003) and runs through interviews in March 2004 (when period $t+1$ covers December 2003 to February 2004). The sample includes only households that had at least one interview during the period in which the CE child credit module was in the field. Also, we drop from the sample any household observation (t or $t+1$) with implausibly low expenditures (the bottom 1% of nondurable expenditures in levels), unusually large changes in age or family size, and uncertain child credit status.

Table 1 presents summary statistics for our dataset. For each household-reference quarter, we sum all child credit checks received by the household in that quarter to create our main payment variable, *Credit*. About 700 observations have a positive value of *Credit*. The average value of *Credit*, conditional on a positive value, is about $610. Of the households receiving credit payments, 42 percent received $400, 27 percent received $800, and 13% received over $800. While the payments need not come in multiples of $400 due to phase-ins and phase-outs, most payments were of these amounts and so the high frequency of such responses in the dataset is reassuring. During the consumption reference periods that cover the entire time of the disbursement of the payments (July and August), about 14% of households report receiving a payment.[14,15]

IV. Empirical Methodology

Consistent with specifications in the previous literature (e.g., Zeldes (1989a), Lusardi (1996), Parker (1999), Souleles (1999), and JPS), our main estimating equation is:

[13]Generalizing across our baseline specifications, the coefficients for total expenditures are usually larger than those for nondurable goods (often about twice as large), but measured with a standard error about five times as large. We also examined the subcategories of goods included in total expenditures but not nondurable expenditures. None of these subcategories showed a statistically significant response to the payments. Based on the point estimates, the largest response came in the transportation subcategory (which includes vehicle purchases and maintenance), however the corresponding standard errors are about as large as those for total expenditures.

[14] Households can report receiving a payment during the month of the interview rather than during the three previous months (the reference period). This explains the small number of payments reported for three-month reference periods ending in November, December, and January.

[15] For comparison, the average 2001 tax rebate conditional on a positive value was slightly smaller at $480, and over three times as many households received a rebate as a child credit payment (JPS).

$$C_{i,t+1} - C_{i,t} = \Sigma_s \beta_{0s} * month_{s,i} + \boldsymbol{\beta_1}' \mathbf{X}_{i,t} + \beta_2 CTC_{i,t+1} + u_{i,t+1}, \quad (1)$$

where C is either consumption expenditures or their log; *month* is a complete set of indicator variables for every period in the sample, used to absorb the seasonal variation in consumption expenditures as well as all other concurrent aggregate factors; and X are control variables (here age and changes in family size) included to absorb some of the preference-driven differences in the growth rate of consumption expenditures across households. $CTC_{i,t+1}$ represents our key child tax credit payment variables, which take one of three forms: i) the total dollar amount of the payment received by household i in period $t+1$ ($Credit_{i,t+1}$); ii) a dummy variable indicating whether any payment was received in $t+1$ ($I(Credit_{i,t+1}>0)$); and iii) a distributed lag of *Credit* or *I(Credit >0)*, to measure the longer-run effects of the payments. We correct the standard errors to allow for arbitrary heteroskedasticity and within-household serial correlation. As an extension, to provide evidence on the role of liquidity constraints, we interact $CTC_{i,t+1}$ with indicators for a household potentially being borrowing constrained.

Under the assumption that $CTC_{i,t+1}$ is (conditionally) uncorrelated with $u_{i,t+1}$, the key coefficient β_2 measures the average response of household expenditure to the receipt of the child credit payment. This response provides a test of the LCPIH. Since Congress passed JGTRRA in May, 2003, and expectations of some tax cut arose even earlier, the payment can be thought of as being pre-announced.[16] In this case, the rational-expectations LCPIH implies that $\beta_2=0$. If instead households were actually surprised by the payment, β_2 should still be small under the LCPIH. This is because the payment represents a relatively transitory increase in income. The incremental increase in the child credit due to JGTRRA itself lasted only two years. Coronado, Lupton, and Sheiner (2006) calculate that the theoretical MPC if households were surprised by the payment would be less than 0.03 over the six months after receipt.

V. The Short-Run Response of Expenditure

This section estimates the short-run change in consumption expenditures caused by receipt of the child tax credit payment, using just the contemporaneous payment variables $Credit_{t+1}$ and $I(Credit_{t+1}>0)$ in equation (1). These estimates are very close to the short-run

[16] One complication is that May of 2003 is contained in period $t+1$ for some (relatively few) households interviewed in August and receiving a payment. Dropping these observations actually leads to slightly stronger baseline results. As for the case when May is contained in period t, given the temporal structure of our data, any announcement effect from the passage of the Act would tend to attenuate our estimate of β_2.

effects estimated in the following section after adding lagged payment variables to the equation. For ease of exposition, we begin by focusing on the short-run effects separately.

In light of potential measurement error and sample-size limitations, in working with data on household expenditure it is generally important to use the largest possible sample and as much variation as possible in the independent variables. Hence we begin by estimating equation (1) utilizing all of the available information about the payments received by each household, using *Credit* as the key regressor. While this variable is analogous to that used in most tests of the PIH, we can go further and investigate its validity by limiting the amount of variation that we utilize, e.g. by using *I(Credit >0),* which includes only variation in whether a payment was received at all in a given period, not the dollar amount of payments received.

In Table 2, the first three columns display the results of estimating equation (1) by ordinary least squares (OLS), with the dollar change in consumption expenditures as the dependent variable and the contemporaneous amount of the payment ($Credit_{t+1}$) as the key independent variable, using all available payment information. The resulting estimates of β_2 measure the average fraction of the payment spent on the different expenditure aggregates in each column, within the three-month reference-period in which the payment was received. We find that, during the three-month period in which a payment was received, relative to the previous three-month period, a household on average increased its expenditures on food by 4 percent of the payment, its expenditures on strictly nondurable goods by 6 percent of the payment, and its expenditures on nondurable goods by 24 percent of the payment. While the estimates in the first two columns are statistically insignificant, the third result is both statistically and economically significant, counter to the LCPIH.

These results identify the effect of a payment from variation in both the timing of payment receipt and the dollar amount of the payment. While the variation in the payment amount is possibly uncorrelated with the residual in equation (1), it is not purely random since the amount depends upon household characteristics such as number of dependents, tax status, and income.

The remaining columns of Table 2 use only variation in whether a payment was received at all in a given period, not the dollar amount of payments received. The second triplet of columns uses the indicator variable $I(Credit_{t+1}>0)$ in equation (1). In this case β_2 measures the average dollar increase in expenditures caused by receipt of a payment. The estimated responses

are essentially zero for food and strictly nondurable goods, but are substantial again for nondurable expenditures, although now significant at only the 8% level. During the three-month period in which a payment was received, relative to the previous three-month period, households on average increased their expenditures on nondurable goods by $132. Compared to an average payment of about $612, this result is consistent with the previous estimate of 24 percent of the payment being spent, an estimate that also used variation in the magnitude of the payments received.

As a robustness check, the third triplet of columns in Table 2 uses the change in log expenditures as the dependent variable. On average in the three-month period in which a payment was received, relative to the previous three-month period, nondurable expenditure increased by 3.4%, again an economically and statistically significant effect. Since average spending on nondurable goods is $4,074, a 3.4% increase on average represents $139 of additional spending, which is very close to the previous result in the sixth column.

Finally, since it is interesting to estimate a value interpretable as a marginal propensity to spend upon the payment's arrival, we estimate equation (1) by two-stage least squares (2SLS). We instrument for the payment amount, *Credit*, using the indicator variable, *I(Credit >0),* along with the other independent variables. As in the first three columns, β_2 then measures the fraction of the payment that is spent within the three-month period of receipt – but in this case without using variation in the magnitude of the payment. As shown in the last triplet of columns in Table 2, the estimated marginal propensities to spend remain close in magnitude to those estimated in the first three columns, which do not treat *Credit* as potentially non-exogenous.[17]

The results in Table 2 identify the effect on spending by comparing the behavior of households that received payments at different times to the behavior of households that did not receive payments at those times. Since some households did not receive any payment, in any period, the results still use some information that comes from comparing households that received payments to those that never received payments. Because the payments were disbursed over just three weeks, there is insufficient variation in timing to identify β_2 with any precision from variation in just the arrival times of the payments. That is, limiting the sample to

[17] The findings in Table 2 are generally robust across a number of additional sensitivity checks. For instance, using median regressions, weighting the sample, or winsorizing the dependent variable, leads to similar (though often somewhat larger and generally more significant) results. Controlling for additional household characteristics like marital status or number (or presence) of children, which are correlated with the credit amounts, leads to similar (sometimes slightly weaker yet still significant) results.

households that received payments and then utilizing only variation in the timing of payment receipt reduces the sample size by over 85% and leads to extremely large statistical uncertainty.

Thus we investigate this issue in an alternative way, by directly controlling for payment receipt. We add to equation (1) an indicator for households that received a payment in *any* reference quarter, *I(Total Credit >0),* which allows the expenditure growth of payment recipients to differ on average from that of non-recipients. In this case, the main regressor $I(Credit_{t+1}>0)$ captures only high-frequency variation in the timing of payment receipt -- receipt in quarter $t+1$ in particular -- conditional on receipt in some quarter. As reported in Table 3, the indicator *I(Total Credit >0)* is never statistically significant. Hence, apart from the effect of the payment, the expenditure growth of payment recipients is on average similar to that of non-recipients over the quarters in the sample period around the payments. Moreover, the estimated coefficients for the effect of the payment ($Credit_{t+1}$ and $I(Credit_{t+1}>0)$) are somewhat larger in size than before and have the same pattern of significance. In sum, the baseline results in Table 2 are not driven by differences in expenditure growth between payment recipients and non-recipients over the sample period. That is, controlling for whether a household received a payment at all, spending significantly increases in the particular quarter of payment receipt.

VI. The Longer-Run Response of Expenditure

To investigate the longer-run effect of the child tax credit payments, we add the first lag of the payment variable, CTC_t, as an additional regressor in equation (1). The resulting estimates are reported in Table 4.

First, note that the presence of the lagged variable does not alter our previous conclusions about the contemporaneous impact of the payment. The coefficients on CTC_{t+1} are quite similar to those in Table 2. Second, the receipt of a payment causes a *change* in spending one quarter later (i.e., from the three-month period of receipt to the next three-month period) that is negative but smaller in absolute magnitude than the contemporaneous change. Since the net effect of the payment on the *level* of spending in the later quarter (relative to the level in the quarter before receipt) is given by the sum of the coefficients on CTC_t and CTC_{t+1}, this implies that, after increasing in the three-month period of payment receipt, spending remains high, but less high, in the subsequent three-month period.

These lagged effects are, however, estimated with less precision. For example, the second column shows that expenditures on nondurable goods rise by 24% of the payment in the quarter of receipt. The expenditure change in the next quarter is -12%, so that expenditures in the second three-month period are still higher on net than before payment receipt by 24%-12% = 12% of the payment. While this result is not statistically significant, the *cumulative* change in expenditures on nondurable goods over both three-month periods is estimated to be 24% + 12% = 36% of the payment, and is significant at the 8% level (bottom row). In the final column using 2SLS, the cumulative change is somewhat smaller and less significant.

In sum, the pattern of coefficients suggests a sizable increase in expenditure at the time of payment receipt, then a decaying and less precisely estimated effect in the subsequent quarter. The point estimates imply that households spent roughly about a third of their payments on nondurable consumption goods cumulatively over the quarter of receipt and subsequent three months.

VII. Differences in Responses across Households and Goods

This section analyzes heterogeneity in the response to the child credit payment, across different types of households and different subcategories of consumption goods. This analysis provides evidence about why household expenditure responded to the payment. For brevity, we report only results from the 2SLS specification, instrumenting the payment and its lag (and any interaction terms) with the corresponding indicator variables for payment receipt (and their interactions, along with the other independent variables).

The presence of liquidity constraints is a leading explanation for why household spending might increase in response to a previously expected increase in income. To investigate this explanation, we test whether liquid or illiquid households were more likely to increase their spending upon arrival of a payment. Households with low liquid wealth may be unable or unwilling to increase their spending prior to the payment arrival. On the other hand, households with high liquid wealth may find the costs of not smoothing consumption across the arrival of the payment to be small (Caballero (1995), Parker (1999), Sims (2003), and Reiss (2004)).

Expanding equation (1), we interact the intercept, payment and lagged payment variables with indicator variables (*Low* and *High*) based on various household characteristics (all from households' first CE interview). We use three different variables to identify households that are

potentially liquidity constrained: age, income (family income before taxes), and liquid assets (the sum of balances in checking and saving accounts). While liquid assets is the most directly relevant of the three variables for measuring liquidity constraints, it is the least well measured and the most often missing in the CE data, so we start with the other two variables. For each variable, we split households into three groups (*Low*, *High*, and the baseline intermediate group), with the cutoffs between groups chosen to include about a third of the payment recipients in each group.

We begin by testing whether the propensity to spend the payment differs by age. Because young households typically have low liquid wealth and high income growth, they are disproportionately likely to be liquidity constrained (e.g., Jappelli (1990) and Jappelli et. al. (1998)).[18] In Table 5, in the first pair of columns *Low* refers to young households (younger than 35) and *High* refers to older households (older than 43), and the coefficients on the interaction terms with these variables represent differences relative to the households in the baseline, middle-age group. While the point estimates suggest that young households spent somewhat more of the payment on nondurable goods than the typical (baseline middle-aged) household cumulatively over the quarter of receipt and the subsequent three-month period (as reported at the bottom of the table), this difference is not statistically significant.

The second pair of columns in Table 5 tests for differences in spending across income groups. Low-income households spent a much larger fraction of their payment on nondurable goods during the three-month period of receipt than the typical (baseline middle-income) household, about 53 percentage points more. This difference is significant at the 6% level. (In absolute terms their increase in spending is statistically significant.) Further, based on the point estimates, high-income households also seem to have spent a somewhat greater fraction of the payment on receipt, although this difference is not nearly statistically significant.

In the subsequent three-month period, the point estimates imply that the low-income households spent an additional 36% of their payment, though this difference is imprecisely estimated. Nonetheless, the cumulative increase in their spending over both three-month periods, a substantial 83% (= 47% + 36%) of the payment, is significant at the 7% level. Despite the large

[18] There is also evidence that some older households increase their spending on receiving their (predictable) pension checks (Wilcox (1989) and Stephens (2003)). Outside the null LCPIH hypothesis of $\beta_2=0$, older households might also spend relatively more because they have shorter time horizons.

standard errors, this cumulative response is significantly larger than that of the baseline group, at the 6% level.

The last pair of columns in Table 5 tests for differences by liquid asset holdings. The pattern of results is generally similar to that for income, though the coefficients are less statistically significant as a result of the smaller sample sizes due to missing asset values.

In sum, the results imply that households with low income or low liquid wealth consumed more of their payments than typical, which is consistent with their facing binding liquidity constraints. These households are consuming most of their payments soon after receipt and not saving much of them for future periods. This could be either because they expect to have higher income in the near future (e.g., due to a stronger economy) or because they have a high propensity to consume one-time or highly liquid funds.[19, 20]

Turning to differences across goods, Table 6 reports estimates from our main dynamic regression (including *Credit* and one lag) with different dependent variables. Each column reports the estimated increase in spending for each subcategory of goods within the broad measure of nondurable expenditures (a complete decomposition). The columns also report the relative importance of each subcategory as a share of nondurable expenditures.

First note that the results are statistically weak, with only the cumulative coefficients for apparel and reading materials being statistically significant. The point estimates also suggest a disproportionately large response in personal care (and miscellaneous items), relative to its share in nondurable expenditures, though this response is nonetheless statistically insignificant. For these narrow subcategories of goods there is much more variability in the dependent variable that is unrelated to the payment regressor. Our previous results, by summing the subcategories into broader aggregates of nondurable goods, averaged out much of this unrelated variability (such as, for example, whether a trip to the supermarket happened to fall just inside or outside the expenditure reference-period).

Second, while comparisons of different subsets of nondurable expenditure must be interpreted cautiously because of potential non-separabilities across goods, it is noteworthy that the largest response comes in apparel, with a cumulative increase in spending of about 33% of

[19]Precautionary motives can generate observationally similar results as liquidity constraints. In particular, buffer stock models can generate large propensities to consume in response to transitory income gains (e.g. Zeldes (1989b) and Carroll (1992).) Adding hyperbolic discounting of the sort studied by Laibson et al. (2001) can generate even larger propensities to consume liquid wealth for reasonable parameterizations.

[20] We did not find statistically significant differences in the response across education groups or marital status.

the payment. This response is statistically significant and much larger than the 8 percent average share of apparel in nondurable expenditures. This result is consistent with the previous results finding the response to the payment coming mainly in the broad measure of nondurable expenditures. The result could reflect a relatively large IES for apparel. That is, expenditures on apparel are relatively less costly to postpone or accelerate, so their large response is consistent both with the presence of binding liquidity constraints and with theories of near rationality (as argued in Parker (1996)). The results could also potentially reflect other confounding differences between households that received the child tax credit and households that did not, such as different patterns of seasonal variation due to the presence of children. To evaluate this possibility, as an extension we investigate what share of the spending response in apparel in Table 6 is due to spending on children's clothes. We find that only about one-third of this response reflects spending on apparel for children. Also, supportive of a causal interpretation of our main estimates, disproportionately large responses of apparel are found elsewhere in response to other payments not directly related to children, for example in JPS and Parker (1999).

VIII. Conclusion

This paper finds that on average households spent about a quarter of their 2003 child tax credit payments on nondurable consumption goods during the three-month period in which the payments were received. This response is statistically and economically significant, and larger than implied by the LCPIH. There is also evidence of an additional, smaller and less precisely estimated, response in the subsequent three-month period, such that households spent roughly one-third of the payments cumulatively over both three-month periods. The responses are largest for households with relatively low liquid wealth or low income, which is consistent with their facing binding liquidity constraints.

These results are generally smaller in magnitude and less precisely estimated than those for the 2001 income tax rebates (JPS). While not statistically different, the point estimates of the contemporaneous effect in 2003 are about 60 percent of those estimated for 2001 in similar specifications, and the estimated cumulative effects are about 45 percent as large.

One interpretation of the difference in magnitude (other than sampling error), is that the child tax credits were distributed during an economic expansion. One might expect liquidity

constraints to be less binding during an expansion, leading to a smaller aggregate spending response. The smaller response could also reflect the fact that the child credit payments represented a more transitory increase in income, or perhaps differences in the populations receiving (and not receiving) the two sets of checks. Finally, the difference could also reflect econometric issues, such as the smaller sample size and smaller amount of randomized timing variation for the child payments, or other differences in identification. We are in the process of further investigating these issues. Nonetheless, the qualitative pattern of results is generally similar to that in 2001. In particular, in both 2001 and 2003 the largest responses come from liquidity-constrained households. This suggests some stability in the underlying mechanism explaining the aggregate response to rebate-type tax payments at different times over the business cycle.

Appendix A: The CE Child Tax Credit Survey Instrument

The following instrument was included in the computer-assisted CE interview.

INTRO: Earlier this year a new Federal tax law was passed which increased the amount of the Child Tax Credit. Many households have received an advance payment check for the increase of the Child Tax Credit.

Screen 1: Since July have [fill:YOU_ANYMEM] received an advance payment check for the Child Tax Credit?
1 – Yes
2 – No
If Yes proceed to screen 2, otherwise end interview

Screen 2: In what month did you receive the check?

Screen 3: What was the amount of the check?
[Allowable range $1 to $9999]

Screen 4: Since July have [fill:YOU_ANYMEM] received an advance payment check for the Child Tax Credit?
1 – Yes
2 – No
If Yes proceed to screen 5, otherwise end interview

Screen 5: In what month did you receive the check?

Screen 6: What was the amount of the check?
[Allowable range $1 to $9999]

Screen 7: Since July have [fill:YOU_ANYMEM] received an advance payment check for the Child Tax Credit?
1 – Yes
2 – No
If Yes proceed to screen 2, otherwise end interview

Screen 8: In what month did you receive the check?

Screen 9: What was the amount of the check?
[Allowable range $1 to $9999]

End interview

Appendix B: The CE Data

We construct the child tax credit payment variable from the CE child tax credit module (Appendix A) in a similar manner to JPS's construction of the 2001 rebate variable. The 2003 data require fewer consistency checks and adjustments, however. This is because by 2003 the CE survey started to use computer-assisted (CAPI) software to input and cross-check respondents' replies. Also, in 2003 no households were asked the special module of child credit questions in multiple interviews, so there was no possibility of repeated reports of the same payment.

We use the following definitions of the other main variables. Age is the average age of the head and spouse when the household is a married couple, otherwise it is just the age of the head. The number of children is calculated as the number of members of the household younger than 18.

Following Lusardi (1996), expenditures on strictly nondurable goods include expenditures on food (away from home, at home and alcoholic beverages), utilities (and fuels and public services), household operations, public transportation and gas and motor oil, personal care, tobacco, and miscellaneous goods. Nondurable goods (broadly defined) adds expenditures on apparel goods and services, health care expenditures (excluding payments by employers or insurers), and reading materials, following Lusardi (1996) but excluding education.

Turning to the sample, we omit observations missing any of the key data that we use in our regressions. Our sample omits the bottom one percent of nondurable consumption expenditures in levels (after adjusting for family size and allowing for a time trend), since this data implies implausibly small (often negative) consumption expenditures. Finally, we drop household observations that report living in student housing, that report age less than 21 or greater than 85, that report age changing by more than one or a negative amount between quarters, or that report changes in the number of children or adults greater than three in absolute magnitude. When we split the sample based on income, we drop households flagged as incompletely reporting income. When we split based on liquid assets, we drop households if the asset information used in computing initial assets (as the difference between final assets and the change in assets) is topcoded.

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Table 1: Summary statistics

Panel A: Sample statistics (N=15,069 observations)

Variable	Mean	Standard Deviation
Expenditures on:		
Food	1,443	1,020
Strictly nondurables	3,091	2,132
Nondurables	4,074	2,791
Change in Expenditures on:		
Food	-1	902
Strictly nondurables	37	1,676
Nondurables	64	2,076
Change in:		
Number of Adults	0.00	0.25
Number of Children	0.00	0.19
Age	51.0	16.7
Credit	28.0	146.4
Credit| *Credit*>0 (N=690)	612.4	332.2
I(Credit>0)	0.046	0.209
Income (N=11,645)	48,652	39,728
Liquid Assets (N=6,088)	8,382	17,197

Panel B: Distribution of positive credit amounts (N=690)

Credit value	Number of Observations	% of Pos Credits
0<*Credit*<400	73	10.6
Credit=400	291	42.2
400<*Credit*<600	6	0.9
Credit=600	36	5.2
600<*Credit*<800	8	1.2
Credit=800	188	27.2
Credit>800	88	12.8

Panel C: Mean and count of credit variable by interview period

Three month period	*Credit*| *Credit*>0	Number (Percent) of obs with *Credit*>0
May - July, 2003 (N=985)	656.5	23 (2.3)
June - Aug, 2003 (N=1,669)	629.1	237 (14.2)
July - Sept, 2003 (N=1,615)	615.0	233 (14.4)
Aug - Oct, 2003 (N=1,606)	576.1	189 (11.8)
Sept - Nov, 2003 (N=1,691)	920.0	5 (0.3)
Oct - Dec, 2003 (N=1,679)	400.0	2 (0.1)
Nov - Jan, 2004 (N=1,604)	800.0	1 (0.1)

Note: based on sample for baseline regression using nondurable goods and *Credit* (first three columns of Table 2).

Table 2: The contemporaneous response of expenditures to the child tax credit

Dependent Variable:	ΔC Dollar change in			ΔC Dollar change in			ΔlnC Percent change in			ΔC Dollar change in		
	Food	Strictly Non-durable goods	Non-durable goods	Food	Strictly Non-durable goods	Non-durable goods	Food	Strictly Non-durable goods	Non-durable goods	Food	Strictly Non-durable goods	Non-durable goods
Estimation method:	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	2SLS	2SLS	2SLS
Credit	0.038	0.060	0.243							-0.016	0.020	0.232
	(0.043)	(0.077)	(0.111)							(0.056)	(0.098)	(0.124)
I(Credit)				-16.0	0.3	131.8	0.11	0.87	3.37			
				(34.0)	(59.0)	(74.5)	(1.68)	(1.31)	(1.31)			
Age	0.447	0.375	0.637	0.369	0.292	0.577	0.038	-0.002	0.014	0.383	0.326	0.624
	(0.278)	(0.566)	(0.688)	(0.280)	(0.568)	(0.689)	(0.010)	(0.010)	(0.010)	(0.281)	(0.570)	(0.692)
Change in # adults	92.8	249.4	268.8	92.8	248.5	267.9	7.06	7.71	7.21	92.6	249.3	268.8
	(34.6)	(77.4)	(99.6)	(34.4)	(77.1)	(99.2)	(1.72)	(1.46)	(1.50)	(34.6)	(77.4)	(99.6)
Change in # children	41.1	77.4	151.0	40.3	76.3	149.7	4.04	4.64	4.98	41.3	77.6	151.0
	(39.3)	(67.2)	(104.7)	(39.2)	(67.1)	(104.4)	(2.08)	(1.56)	(1.60)	(39.3)	(67.2)	(104.7)
N	15,069	15,069	15,069	15,161	15,161	15,161	15,129	15,159	15,161	15,069	15,069	15,069

Notes: All regressions include a full set of month dummies, following equation (1). Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. The coefficients in the third triplet of three columns are multiplied by 100 so as to report a percent change. The last three columns report results from 2SLS regressions where *I(Credit)* with the other regressors are used as instruments for *Credit*.

Table 3: The contemporaneous response of expenditures: extensions

Dependent Variable:	ΔC Dollar change in		ΔlnC Percent change in		ΔC Dollar change in	
	Strictly Non-durable goods	Non-durable goods	Strictly Non-durable goods	Non-durable goods	Strictly Non-durable goods	Non-durable goods
Estimation method:	OLS	OLS	OLS	OLS	2SLS	2SLS
Credit	0.052	0.279			-0.009	0.281
	(0.095)	(0.139)			(0.132)	(0.168)
I(Credit)			0.014	0.046		
			(0.017)	(0.017)		
I(Total Credit>0)	7.20	-31.84	-0.006	-0.014	18.77	-32.24
	(32.89)	(44.36)	(0.008)	(0.008)	(37.56)	(48.30)
N	15,069	15,069	15,159	15,161	15,069	15,069

Notes: All regressions also include the change in the number of adults, the change in the number of children, the age of the household, and a full set of month dummies. Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. The coefficients in the second pair of columns are multiplied by 100 so as to report a percent change. The final pair of columns reports results from 2SLS regressions where *I(Credit>0)* with the other regressors are used as instruments for *Credit*. *I(Total Credit >0)* is an indicator for households that received a credit in some reference quarter, whereas *I(Credit >0)* indicates receipt in the contemporaneous quarter (*t+1*) in particular.

Table 4: The dynamic response of expenditures to the child tax credit

Dependent Variable:	ΔC_{t+1}		$\Delta \ln C_{t+1}$		ΔC_{t+1}	
	Dollar change in		Percent change in		Dollar change in	
	Strictly Non-durable goods	Non-durable goods	Strictly Non-durable goods	Non-durable goods	Strictly Non-durable goods	Non-durable goods
Estimation method:	OLS	OLS	OLS	OLS	2SLS	2SLS
Credit$_{t+1}$ or I(Credit$_{t+1}$)	0.060	0.239	0.82	3.25	0.019	0.226
	(0.076)	(0.110)	(1.29)	(1.30)	(0.097)	(0.123)
Credit$_t$ or I(Credit$_t$>0)	-0.011	-0.120	-1.52	-3.07	-0.030	-0.145
	(0.082)	(0.107)	(1.30)	(1.30)	(0.094)	(0.118)
Implied cumulative fraction of credit spent over both three-month periods	0.109	0.358	NA	NA	0.007	0.307
	(0.150)	(0.203)			(0.189)	(0.243)
N	15,069	15,069	15,159	15,161	15,069	15,069

Notes: All regressions also include the change in the number of adults, the change in the number of children, the age of the household, and a full set of time dummies. Standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. The coefficients in the second pair of columns are multiplied by 100 so as to report a percent change. The final pair of columns reports results from 2SLS regressions where *I(Credit)* and its lags, along with the other regressors, are used as instruments for *Credit* and its lags.

Table 5: The propensity to spend across different households

Dependent variable: ΔC_{t+1}

Dollar change in:	Strictly Non-dur. goods	Non-durable goods	Strictly Non-dur. goods	Non-durable goods	Strictly Non-dur. goods	Non-durable goods
	Interaction: Age Low: age <35 High: age >43		Interaction: Income Low: ≤ 41,200 High: > 77,000		Interaction: Liquid Assets Low: ≤ 560 High: > 4,000	
Credit$_{t+1}$	0.078	0.322	-0.093	-0.069	-0.097	0.130
	(0.129)	(0.176)	(0.163)	(0.198)	(0.208)	(0.275)
*Credit$_{t+1}$*Low*	0.040	0.018	0.127	0.534	0.240	0.261
(Low group difference)	(0.193)	(0.247)	(0.222)	(0.286)	(0.269)	(0.343)
*Credit$_{t+1}$*High*	-0.251	-0.348	0.243	0.227	0.188	0.133
(High group difference)	(0.244)	(0.317)	(0.254)	(0.321)	(0.330)	(0.411)
Credit$_t$	0.033	-0.207	-0.024	-0.165	0.216	-0.121
	(0.134)	(0.168)	(0.145)	(0.188)	(0.219)	(0.312)
*Credit$_t$*Low*	-0.179	0.082	0.012	0.062	-0.194	-0.062
(Low group difference)	(0.200)	(0.254)	(0.258)	(0.300)	(0.399)	(0.483)
*Credit$_t$*High*	0.000	0.226	0.130	0.338	-0.267	0.054
(High group difference)	(0.230)	(0.290)	(0.226)	(0.296)	(0.372)	(0.490)
N	15,069	15,069	11,503	11,503	6,040	6,040
	Implied cumulative fraction spent over both three month periods for each group					
Baseline Group	0.189	0.437	-0.211	-0.303	0.022	0.138
	(0.262)	(0.363)	(0.317)	(0.408)	(0.407)	(0.547)
Low group	0.089	0.556	0.055	0.827	0.307	0.598
	(0.307)	(0.374)	(0.349)	(0.458)	(0.435)	(0.529)
High group	-0.312	-0.034	0.405	0.488	0.131	0.457
	(0.412)	(0.537)	(0.408)	(0.518)	(0.520)	(0.643)

Notes: All regressions also include separate intercepts for the High and Low groups, the change in the number of adults, the change in the number of children, the age of the household, and a full set of month dummies. All results are from 2SLS regressions where *I(Credit>0)* and its lag and interactions, along with the other regressors, are used as instruments for *Credit* and its lag and interactions. Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. All sample splits are chosen to include about 1/3 of credit recipients in each grouping.

Table 6: The propensity to spend on different categories of goods

Dependent variable:

ΔC_{t+1}

Dollar change in:	Panel A: Food			Panel B: Additional strictly nondurable goods				Panel C: Additional nondurable goods		
	Food at home	Food away from home	Alcoholic beverages	Utilities, Household operations	Personal care and misc.	Gas, motor fuel, public transportation	Tobacco products	Apparel	Health	Reading
Average share of Nondurable Goods	0.3	0.08	0.01	0.25	0.03	0.11	0.02	0.08	0.11	0.01
$Credit_{t+1}$	-0.016	0.000	0.000	0.033	0.005	0.005	-0.008	0.224	-0.022	0.006
	(0.038)	(0.037)	(0.009)	(0.039)	(0.035)	(0.048)	(0.013)	(0.044)	(0.048)	(0.004)
$Credit_t$	-0.007	-0.003	0.004	-0.050	0.052	-0.027	0.001	-0.118	-0.005	0.009
	(0.037)	(0.033)	(0.008)	(0.033)	(0.046)	(0.041)	(0.009)	(0.036)	(0.048)	(0.008)
Implied cumulative fraction spent over both 3-month periods	-0.038	-0.003	0.004	0.015	0.062	-0.017	-0.015	0.330	-0.050	0.020
	(0.076)	(0.075)	(0.018)	(0.071)	(0.074)	(0.084)	(0.027)	(0.086)	(0.095)	(0.010)

Notes: N=15,069 for all regressions. All regressions also include the change in the number of adults, the change in the number of children, the age of the household, and a full set of month dummies. Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. All results are from 2SLS regressions where *I(Credit)* and its lag, along with the other regressors, are used as instruments for *Credit* and its lag.