Consumption Responses to Temporary Tax Incentives: Evidence from State Sales Holidays*

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Abstract

Every year many states offer sales tax holidays (STHs) temporarily exempting items like clothes, shoes and school supplies from the state sales tax. We use two data sets, the Diary portion of the Consumer Expenditure Survey and a unique data set of credit cards transactions, to investigate the spending response to these temporary tax changes. Using a diff-in-diff methodology, we find substantial increases in spending on covered goods during these holidays that are not offset by declines in either spending on other goods or spending before or after the holidays. These spending responses are larger among households with children and limited to children's apparel. Robustness checks suggest that these findings are not driven by unobserved seasonal demand shocks. Further, our computed price elasticities are orders of magnitude larger than those found previously in the literature, suggesting a behavorial response motivated by additional incentives than the small price changes resulting from the STH.

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1. Introduction

Governments frequently alter tax rates or provide bonuses or rebates in order to stimulate overall consumption or the consumption of particular items. For example, the 2009 US Car Allowance Rebate System, "cash for clunkers," program subsidized the trade in of older vehicles for more efficient newer one in hopes of stimulating economic activity through increased auto sales (Mian and Sufi, 2012). George Bush provided tax rebates in 2008 to stimulate consumption in light of a sluggish economy (Parker, Souleles, Johnson, and McClelland, 2013). The Singapore government shared the proceeds from the nation's economic growth in 2010 through one-time payout of Growth Dividends to all adult Singaporeans (Agarwal and Qian, 2013). Similarly, many U.S. states seek to increase and support the consumption of back to school items through the use of Sales Tax Holidays (STHs) which temporarily exempt particular items, usually apparel and school supplies, from the state level sales tax.

This paper uses two complementary data sets to analyze how consumer spending responds to STHs. We test whether spending on goods temporarily exempt from taxes during the STH increases significantly during the STH period by comparing consumption in states with STHs to consumption in other states on the same dates.

Previewing the results, we find consumer spending increases during STHs to be statistically significant, economically meaningful, and concentrated in the categories that are tax exempt. For example, we find a $1.17 increase in overall daily spending on clothing in states with a STH relative to spending on the same date in states without a STH and a $1.05 increase in shoe spending. These dollar amounts represent increases in spending of 29% and 88%, respectively, relative to typical daily spending. Similarly, we find an increase in credit card spending at apparel merchants of $0.76 or 65% on clothing sales tax holiday dates and an increase of $0.27 or 25% at big box stores. When we investigate heterogenous effects across individuals we find that consumers with children increase their expenditures more than other consumers and that households increase the amount spent on children's clothing.

We also test for inter-temporal and cross-product substitution due to the STH. There is no evidence of cross-product substitution i.e., consumers do not shift their spending patterns away from goods that are not covered under the STH. We also find that spending does not drop either before or after the STH. In fact, spending changes before and after the STH are positive, but statistically insignificant. We also study the border effect of having a neighboring state hold a STH, and find that consumers living in zip codes bordering a STH do spend more as compared to consumers not along the border.

To put our results in a broader prospective, we calculate price elasticities. These elasticities are large and range (in absolute value) from 6 for big box merchants to 30 for kids clothing merchants. Interestingly, we obtain similar estimates from our two data sources. These

elasticities are far larger than many estimates in the literature and suggest that consumers are responding to something in addition to the modest drop in the after tax price.

The pattern of positive coefficients in the periods before and after STHs raise concerns that we are picking up seasonal demand patterns. In particular, we worry that STHs are deliberately placed during periods of state-specific peak seasonal demand. If this is the case, our estimated effects will conflate the correlation between seasonal demand and spending rather that the effects of the STH itself. We use two different tests to confirm that seasonal demand peaks are not driving our results. First, using the credit card data, we develop three alternative control groups. If there are seasonal demand peaks, then our baseline control group that uses consumers in all other states is not the right one. Shoppers in a sales tax holiday state should be compared with shoppers in other states on the same date who are subject to the same demand patterns. We compare consumers in sales tax holiday states to others in states without a sales tax holiday in the same region, to others living in zip codes with the same average August temperature, and to others in states that start school in the same general time frame. Our results are unchanged with these alternative control groups. These results give us confidence that we are picking up the causal effect of the STH on consumer spending. Second, we run a counterfactual analysis using the Diary data, where we focus on the years preceding the introduction of STHs and analyze how individuals in a state behave on days that would eventually have an STH in their state. We do not find increased spending on these dates. Overall, these results suggest that there are large spending responses to the STH.

Our paper contributes to several strands of a diverse literature. Our work directly contributes to the small body of work that evaluates the effectiveness of the STH. Cole (2009a) presents the first fully specified econometric evaluation of an STH. Cole estimates how an STH affects the prices and quantities of computer purchases. He finds weak evidence that the sales tax savings is either fully passed through or mildly overshifted to consumers during the STH. Cole (2009b) analyzes the fiscal impact of these tax holidays and finds that there is about a 4 percent reduction in states' sales and use tax collection in the months with an STH. His evidence is consistent with households shifting consumption within a month to take advantage of the STH, but he finds no evidence that households consume less in the months before and after the STH.

We also contribute to the vast literature on studying consumption responses to various fiscal stimulus programs. Some recent studies include Shapiro and Slemrod (1995), Souleles (1999, 2000, 2002), Parker (1999), Browning and Collado (2001), Hsieh (2003), Stephens (2003), Johnson, Parker, and Souleles (2006), Bartrand and Morse (2009), Mian and Sufi (2012), Parker, Souleles, Johnson, and McClelland, (2013) and Agarwal and Qian (2013). The literature finds mixed evidence: some studies find a consumption response that is essentially zero, while others conclude that liquidity constrained consumers respond positively to the fiscal stimulus programs. Our work is more directly related to the work by Agarwal, Liu, and Souleles (2007) on the 2001 tax rebates. They exploit the random timing of the 2001 tax rebates to identify the dynamic

response of credit card payments, spending, and debt to the rebates. They find that consumers initially saved much of the rebates, on average, by increasing their credit card payments and thereby paying down debt. But spending did subsequently increase, offsetting the initial extra payments, so that eventually debt rose back near its original level. One challenge in this research area is to find methods that allow the creation of a counterfactual path of consumption. Our comparison across states with differing policies at a point in time offers a sensible means of generating this counterfactual.

Lastly, our work is also related to the general literature on cross-border and online shopping behavior of consumers in response to state and county sales taxes. Goolsbee (2000) finds that consumers in high tax areas are more likely to make online purchases. Einav, Knoepfle, Levin, and Sundaresan (2012) study price elasticities with respect to effective sales taxes using the purchase decisions of eBay customers. Our price elasticity measures are line with the above two studies. Agarwal, Chomsisengphet, Ho, and Qian (2013) also find that cross border sales are higher in Malaysia for goods that are more expensive in Singapore.

Finally, we also contribute to the broad literature that exploits the program design features of various fiscal programs and studies the effectiveness of these programs. Aaronson, Agarwal, and French (2012) and Agarwal et. al. (2012) study the changes in minimum wage polices and the HAMP programs respectively. They find positive consumption response to the changes in the minimum wage policies and a higher modification rate due to the HAMP policy.

The rest of the paper is organized as follows. The next section provides a brief background about the STH policies. Section three discusses the data. Section four presents the estimation model and discusses the results, and section five provides concluding remarks.

2. Background information about Sales Taxes, the STH, and Policy Objectives of STH

Sales taxes are levied on almost every tangible good and a number of services—the exceptions being a few necessity items such as food and prescription drugs. The tax applies at the retail level, is ad valorem, and is remitted by vendors. Sales taxes are levied by different levels of government; 45 states have some type of state-level sales tax, with counties, cities, and other local governments levying additional sales taxes. In 2010, the average state-level sales tax was 5.6 percent and the median was 6.0 percent, with a range of 2.9 percent in Colorado to 8.25 percent in California. Just under a quarter of state own-source revenues are derived from the general sales tax. Sales taxes affect the vast majority of Americans almost every day of the year.

Sales tax holidays are state policies that suspend the state sales tax on targeted retail goods for a set period of time. These holidays have grown in popularity over the last 20 years. In 2012, 18 states offered STHs impacting the over 120 million people living in these states.

There are three stated objectives of STHs. First, STHs aim to save consumers money by lowering the purchase price of retail goods. Relatedly, the dates for STHs are often chosen to coincide with periods of high seasonal demand, such as back-to-school shopping periods, with the intention of providing tax relief to households with children and lower-income, liquidity-constrained households or those otherwise deemed worthy of tax relief by policymakers. In justifying Illinois's 2010 holiday, the lead sponsor said that for "[w]orking families with kids going back to school, we want to give them a break." (Associate Press, 2010). Second, lowering sales tax rates helps retailers increases their sales. Third, by targeting specific items for tax exemption, the STH encourages consumption of specific goods that policy makers believe have inherent social benefits. In this study we primarily test whether STHs increase the consumption of covered goods. While our objective is not to test any specific theoretical model, our results can also be interpreted as a test of the Life-Cycle/Permanent Income (LCPI) model. If the LCPI holds, we should not find significant increase in spending over a broad window due to a small, temporary and expected change in income (reduction in taxes).[1] However, we would expend to see temporarily spending responses during a temporary price drop.

Despite the growing popularity of the STH, little formal evaluation has been conducted to determine whether they actually accomplish policymakers' stated goals. There are a number of reasons why instituting an STH may be ineffective, or why doing so may be considered flawed public policy. First, while the sales tax is eliminated for a brief period of time, consumers would not see any benefit if retailers increased the pre-tax price of items; the degree by which after tax prices are lowered depends on the incidence of taxation. Second, even if after-tax prices do drop consumers may not purchase any more of the targeted item—the degree of change in consumer response depends on the elasticity of demand for the eligible items. Third, the transient nature of the STH may cause consumers to alter their consumption patterns across time leaving their total consumption of the good unchanged. In this case, retailers may not benefit from the holiday. Fourth, because the STH is available to all consumers, unintended recipients, such as those without children or wealthy households, may also take advantage of the holiday. Wealthy individuals may better take advantage of the STH than the intended low-income beneficiaries because the wealthy have greater access to credit and discretionary income which allows them to time consumption to respond to tax incentives. In particular, this may be too blunt a policy instrument for subsidizing the consumption of targeted groups. Fifth, there have been complaints of onerous compliance costs for retailers who are forced to participate in an STH.[2]

Cole (2008) presents a historical synopsis of the STH. Briefly, the first STH occurred in 1997 in New York and was enacted to help retailers compete with their tax-free competitors in neighboring New Jersey. Lasting seven days, the holiday exempted general use clothing and

[1] As the article from the Smart money website documents, "consumers can shave up to $48 off the average spending of $689 on kids in grade school; and up to $63 on college-bound teens' average $907 tab." http://www.smartmoney.com/spend/deal-of-the-day/making-the-most-of-salestax-holidays-1343336950640/

[2] For further criticisms, see Hawkins and Mikesell (2001).

footwear priced under $500 from the state-wide 4% sales tax. The STH then spread to Florida in 1998 and Texas in 1999. By 2011, 23 states and the District of Columbia had instituted at least one STH. STHs are state level policies although in a number of cases, localities have also suspended their sales tax during the state holiday. The duration of the STH, the type of exempted items, the ceiling below which these items could be purchased tax-free, and even the number of STH offered each year are all parameters set by the state legislative bodies; in a given year, no two STH have been identical.

3. Data

We use two complementary data sets to evaluate the consumption response to Sales Tax Holidays. The first dataset uses micro data on daily household consumption from the Diary portion of the U.S. Bureau of Labor Statistics' (BLS) *Consumer Expenditure Survey* (CEX). The second dataset is a proprietary dataset on credit card transactions issued from a large financial institution. As discussed by Gross and Souleles (2003), credit cards play an important role in consumer finances, so they can be quite useful for studying consumer behavior. About 20 percent of aggregate personal consumption is already being purchased using credit cards. Moreover, for most households credit cards represent the leading source of unsecured credit and about two-thirds of households have at least one bankcard.[3] These two datasets hence allow for a a complimentary and comprehensive analysis of the effects of STH on consumer behavior.

3.1 BLS Diary survey

The Consumer Price Index relies on Diary data for the measurement of all home food consumption, all footwear purchases, and most clothing purchases. The Diary survey tracks the spending patterns of households for two weeks and households use diaries to track daily spending on detailed items. However, the Diary survey itself covers all purchases and expenses. From the Diary survey, we know the calendar date of a given purchase, the type of item purchased, the state where the household resides, and the after-tax cost.[4] For clothing, shoes, and jewellery, we also know the age group (over or under 15) and sex of the person for whom the item was purchased. The CEX also includes detailed household and person level socio-demographic data.

We link the Diary data to information on STHs from 1997 (the year of the inaugural STH) to 2011 based on the state of residence reported in the Diary. Cole (2008) contains data on all the

[3] Moreover, Japelli, Pischke, and Souleles (1998) found that people with bankcards were better able to smooth their consumption past income fluctuations than were people without bankcards.

[4] The state of residence is available in the public use microdata for most households. It is omitted or recoded for some households. We delete households whose state of residence we are not certain of from our entire analysis. The CEX adds sales taxes to pre-tax prices before releasing the microdata. They incorrectly add taxes during STHs. We remove state sales tax from eligible items purchased during STH before performing our analysis.

STHs between 1997 and 2007. For the years 2008-2011, we use data from the Federation of Tax Administrators (2011). Data on the STHs in our data set are in Table 1. The five most popular items that are exempt from sales tax during an STH are clothing, shoes, clothing accessories, computers, and school supplies. The modal price ceilings at which these items are exempt is $100 for clothing, shoes, and clothing accessories; $2,500 for computers; and $75 for school supplies. As stated earlier, the dates for STHs are chosen to coincide with periods of high seasonal demand, the most popular being back-to-school season.

Using the merged data, we measure spending on a given day by household, and hence the unit of analysis is a "household- date." Our data set tracks the daily purchasing decisions of over 65,000 households, with over 700,000 household-date observations. On a given date some households live in states where there is a STH, while other households live in states where sales taxes remain unchanged. Conceptually, our identification strategy is to use consumption patterns among individuals living in states without a sales tax holiday on a given date as a control for consumption patterns among individuals living in states where there is a sales tax holiday. This comparison is valid if consumers in states with and without sales tax holidays would have had the same consumption patterns had the STH not occurred. In order to facilitate this comparison, we assume that individuals purchase items (and thus pay sales taxes) in the state where they live. To identify the effect of the STH, we separately tabulate spending for the relevant categories of expenditures and focus on the categories for which states have enacted sales tax holidays. In particular, we investigate the consumption effects of sales tax holidays for clothing, shoes and school supplies[5].

Summary statistics from the merged Dairy data are presented in Table 2. The table shows the daily means of total household expenditures for all items, for non-exempt itemd, and the exempt items that we investigate (i.e clothing, shoes, school supplies). Apparel expenditures are further divided into the age and gender of the person for whom the items are purchased.[6] The first column shows the daily mean among all households in the sample, while the second column shows the mean conditional on making a purchase in a given category. The final column shows the mean for households observed on a Friday, Saturday or Sunday in August – when many STHs occur. On an average day, households spend $135. This increases to $192 when we limit the sample to the 70% of households making any purchase. Of the $135 total, $127 is spent on items not tax-exempt during STHs and $6.09 on items that are traditionally tax-exempt during STHs. These numbers change when limited to weekends in August, with households spending less on all items ($126) and slightly more on STH-exempt items ($7.52). Our tabulations show

[5] We do not look at expenditures on clothing accessories and computers. The clothing accessory items exempted during STHs are not consistent across states and do not easily map into the categories available in the CEX. Further, expenditures on big ticket durables such as computers is more accurately measured in the CEX Interview survey. Initial investigations of the effect of STHs on purchases of computers and clothing accessories yielded inconsistent STH effects that were imprecisely estimated.

[6] Spending on computers and clothing accessories are included in total expenditure but excluded from all other calculations.

that spending on clothing, shoes and school supplies only accounts for about five percent of all daily spending on a typical day and six percent of spending on an August weekend day.

Not only do STHs cover a small percentage of the items purchased on a typical day, but they only affect a small percentage of days each year. The bottom of Table 2 shows the frequency of STHs in our data. The average STH lasts 4.8 days, a fact highlighted by the frequency in which we observe STHs dates in our data: while our data set consists of over 700,000 household-date observations, we have only 3940 observations where we observe household expenditures on an STH. STHs that exempt clothing are the most popular, applying to 2547 of our household-date observations. The combination of the small share of daily consumption devoted to tax-exempt items on STHs and the infrequent occurrence of STHs suggest that STHs have a relatively small window for influencing household consumption. Table 2 also shows summary statistics for the demographic variables we include as controls in our analysis of consumption patterns.

3.2 Credit Card Transactions

Our second dataset is based on unique proprietary information for 2003 from a large financial institution that issues credit cards nationally. The bulk of the data consists of the main billing information listed on each account's monthly statement, including total payments and spending, balances, and debt, as well as the credit limit. The dataset is essentially the same one used by Agarwal, Liu, and Souleles (2007) but with one *key* difference. In addition to the aggregate monthly billing information, we have access to individual transaction information listed on each account's monthly statement. Specifically, we know the exact date, amount and type of every transaction (i.e. $83 at Hyatt Hotel, $489 purchase at Best Buy, and $218 purchase from US Airways, etc.), of the cardholder over the sample period. We also know the merchant category code (MCC) of each transaction allowing us to separate cardholder purchases into categories that can help us measure the differential response to STHs. The appendix discusses the MCC is greater detail. The sample covers over 75,000 consumers representing all states.

We aggregate the transactions for each account holder in a day to create daily spending. As a result, in our data set, an observation is an "account-date". We only have an observation for a household if some type of transaction occurred on a given date. In the event that the household did not use their credit card on a particular date, it would not be included in the underlying data set. This is problematic because we would like to include households even if they choose not to engage in any credit card spending on a date. One way the sales tax holiday may influence spending is by inducing households that would not have otherwise gone shopping to do so. In order to capture this effect, we expand the sample to include households on every day between when we first and last observed them in the sample. On these added days the household has no spending. Rather than being transactions based, we now have a sample that includes all open accounts. The transaction sample had 1.6 million observations; the open account sample has

10.3 million observations. This indicates that on most days when the account is open, no transactions occur.

We categorize spending based on the type of merchant where the item was purchased using the MCC. We do not know which items were purchased in a transaction, and so create a series of spending categories based on the merchant categories. We measure total spending and create ten spending subcategories that we think are particularly relevant for investigating sales tax holidays. The category most similar to the ones used in the Dairy dataset is apparel, which we further organize into four categories: clothing, kids clothing, shoes, and other apparel. Clothing includes department store purchases because approximately 60% of items purchased at department stores are clothing (see Nordstrom 2001). Kids clothing includes only those retailers that specifically concentrate on items for children, while other apparel is primarily apparel accessories (although many of these merchant also carry some clothing items). Spending at non-apparel merchants is further divided into Big Box retailers, book and school supply merchants, appliance stores, and other. Big box retailers include merchants that sell a wide range of products often including groceries.[7] We seperate books and school supplies, and appliances because a number of the sales tax holidays specifically target these items. Other non-apparel is the largest category and measures spending at grocery stores, restaurants, gas stations, drug stores, and other merchants that are unlikely to have many temporarily exempt items.

In addition to information on transactions by merchant category, we also have account identifiers, and limited measures of the socio-demographics of the account holder, including FICO score, age, income, zip code and state of residence, and a dummy for whether there is a co-applicant on the account. We begin using data for 2003 covering February 8 - October 20, choosing this period because it includes the heart of our data series where we have at least 1000 observations each day.

During our sample period, there were nine STHs. Details are in Table 3. We note that clothing and footwear is exempt in eight of the sales tax holidays, school supplies in four, computers in five, and some home furnishings in one. We also note that these sales tax holidays vary in duration from two days to one week, and that all occur during the back to school shopping season. The first begins on July 31 and the last ends on September 1, with the majority covering over the weekend of Friday, August 1-Sunday, August 3.

In a similar fashion to the Diary data, we link this information on STHs to our data on spending by the state of residence of the account holder and the date when the transaction occurred. In the first column of Table 4, we display variable means for the open account sample. On an average day, an account holder spends about $17 on his credit card, but there exists substantial variation

[7] According to Target's 2011 annual report, 19% of their sales were in the apparel and accessories category. The largest category was household essentials with 25%. Wal-Mart's sales mix was 7% apparel in 2011. The largest category was grocery at 55%. (Wal-mart Stores, Inc, 2012)

across observations. Most of the spending is in the "Other" category of non-apparel spending. The average amount of apparel spending is $1.65, with the majority limited to clothing. An additional $1.12 is spent at big box retailers and $0.64 at appliance stores. Spending in the remainder of the categories is below $0.50 on the average day. The average account holder in our sample is 46 years old, earns $72K per year and has a FICO score of 741 (sample median is 750). Just over a third of the sample has a co-applicant. These summary statistics underscore that our sample is relatively well off . Average income is above average household income in the US of $68k in 2003 (in 2008 dollars) and the median FICO in the sample is above the U.S. median of 723. In the final rows of the table, we show the frequency of observations that occur during STHs in the state where the account holder lives. Only 0.6% of our observations occur when there is a sales tax holiday in the state where the household lives which, due to our large sample size, equals over 60,000 observations.

It is important for our identification strategy that the consumers in states that have a STH are similar to those in states that do not. We confirm that the distribution of observables for consumers in STH states looks remarkably similar to consumers in non-STH states.

The two data sets have different strength and weaknesses. The Diary data covers spending over a longer time horizon – 15 years. In addition, we have information on spending independent of the payment method used and including all households, not just those with credit cards. Also, we have detailed information on the items that were purchased. For instance, we know what the household spent on children's clothing and women's shoes. The data also provide a rich array of socio-demographic variables. However, the same household is only observed for at most two consecutive weeks and there may be misreporting due to the fact that the data come from a survey.

The credit card data set is much larger than the Diary data set and suffers from little measurement error because it is administrative data. Also, we have a longer panel and observe the same consumers before, during, and after the STH. As a result, it is possible to study high frequency dynamics. However, the credit card data contain information on the merchant type rather than the item purchased, a fact that hinders our analysis since it is items rather than merchants that are temporarily exempt from the sales tax. The credit card data also only have transactions that are paid for by credit card. Fortunately, this is less of a problem for the STH categories than for others because consumers are more likely to use credit cards to buy apparel than most other items (see Johnson, Parker, and Souleles, 2007). According to the American Bankers Association (2005), credit cards are used for 42% of department store purchases which is the highest percentage among the nine expenditure categories they investigate. The credit card sample is also restricted to those households with credit cards which is an advantaged sample. While the credit card data have some well measured socio-demographic variables – in particular, age, income, and FICO score –it does lack information on family structure aside from an indicator as to whether the account holder has a co-applicant.

4. Model and Results

We use the same estimation model and identification strategy for both data sets. Our analysis seeks to identify the consumer response to a sales tax holiday. Briefly, our model is as follows:

$$y_{ist} = \beta_0 + \beta_1 \times STH_{ist} + \gamma \times X_i + \theta_t + \varepsilon_{ist} \qquad (1)$$

Where y_{ist} is an outcome measuring the purchases by household *i* in state *s* on date *t*. STH_{ist} is an indicator variable equal to 1 if there is a STH on date *t* in the state *s* where household *i* lives. X_i is a vector of the household-level controls including state of residence. θ_t are time fixed effects, and ε_{ist} is an error term. Our time fixed effects are calendar dates (for example, August 10, 2003).

We control for the calendar date of the observation because STHs are deliberately placed during times of high demand. STHs frequently occur on weekends and more shopping for covered items, such as clothing, occurs on Fridays, Saturdays and Sundays than during the remainder of the week. In addition, sales tax holidays tend to be placed during the back to school shopping season from late July-early September when spending on the covered items tends to be high.

4.1 Baseline Results

Table 5 presents our baselines results from estimating model (1) on the Diary data for total spending, for a measure of spending on non-exempt items, labelled "other", and for spending on three different categories of items frequently exempt from sales taxes during STHs: clothing, shoes, and school supplies. For each good, we investigate the effect of STHs that exempt that item category on spending in that category. For total spending and "other" we investigate the effect of having an STH on any item. Each column in the table represents the results from a separate regression, and we report our estimate of β_1, the marginal effect of a sales tax holiday on daily spending, y. At the bottom of the table we divide this effect by mean daily expenditure in the category to give an indication of the magnitude of this increase in spending. We also divide β_1 by the average daily expenditure during a weekend on August to offer another reference point for the magnitude.

Our baseline results reveal that STHs have a positive and statistically significant effect on household clothing and shoe expenditures. The number 1.17 in the second column of Table 5 indicates that STHs increases daily clothing spending by $1.17. Further, we find that this effect is large when compared to average expenditures. The number 0.29 at the bottom of the table shows that this $1.17 represents 29% of average daily household clothing spending. We also find that spending on Shoes increases by $1.05, or 88%. We find no change in school supply spending. In the absence of any change in pre-tax prices or any consumer response during a sales tax holiday, these numbers would be expected to be negative because they measure after

tax spending which would fall due to the lower tax rate. If retailers increased prices to keep the after-tax price unchanged and consumption was unchanged we would find zero response.[8] These numbers thus indicate that households respond to the STH by buying more.

In the final column we investigate whether there are changes in the consumption of non-exempt items as well. We hypothesize two distinct ways in which households may change their normal shopping behavior to take advantage of an STH. First, they may shift consumption away from items that are not exempt from sales tax. If households devote a set amount of time or money for consumption every day, then consumers that spend more time or money purchasing items that are exempt from sales taxes may subsequently have less time or money to dedicate to purchasing items that are not. Alternatively, they may increase their consumption of other items because they are already out shopping. This is one of the justifications for the Illinois sales tax holiday—that the consumption of "other items pulled off shelves while Mom's in the store" will also increase. (Associated Press, 2010) We find insignificant positive increase in spending on other items.

Based on these results, we calculate price elasticities for clothing and shoes under the assumption that the price change faced by consumers is equal to the removal of the sales tax. We measure spending in the absence of the STH as average spending in non-STH states on the STH dates, and our estimated increase in spending is assumed to be relative to this average. The resulting elasticities, and 95% confidence intervals for clothing and shoes are displayed in Table 6. The estimated elasticity for clothing is -7.4 and for shoes is -21.1. These elasticities far larger than others in the literature; for example, Seale et. al. (2003) estimates that the price elasticity of demand for clothing and footwear in the United States is -0.7. The modest temporary decrease in price leads to extremely large increases in spending.

We can also decompose these elasticities into the intensive and extensive margin. We measure the extensive margin elasticity by estimating the effect of STHs on the probability of making a purchase and assume the intensive margin elasticity is the total elasticity minus this value. The results from these calculations are also in Table 6. We find that the holidays both increase the spending of shoppers and draw non-shoppers into stores.

While our elasticities are estimated as price elasticities, they may make more sense when taken in the context of intertemporal substitution. While apparel items are technically classified as non-durable goods, items purchased during the STH window can be enjoyed after the tax holiday ends. Estimates of the intertemporal elasticity of substitution (EIS) range from 0.5-1. (Attanasio and Wakefield 2008). Note that under the assumption that the EIS is 1, we would expect spending to be unchanged during the sales tax holiday because the drop in price would be exactly

[8] In a working paper we also investigate the effect of sales tax holidays on making a purchase and on the quantity of items purchased. We find a significant increase in the quantity of items purchased for all three categories and significant increases in the probability of making a purchase for clothing and shoes.

offset by the increase in consumption (Crossley, Low and Wakefield 2009). By contrast, we find a dramatic increase in spending, suggesting a far higher EIS. However, the estimates in the literature are based on consumption measured in year long periods. We would anticipate that as the period of the price change grows shorter, consumption responses would be more dramatic. We will return to this issue when we investigate intertemporal patterns in detail in section 4.4.

Next, we perform the same analysis with the credit card data and present out results in Table 7 We restrict the sample to the period from May-September to cover the back to school spending period and in addition, replace the vector of household controls with account fixed effects. The model we estimate is as follows:

$$y_{ist} = \beta_0 + \beta_1 \times STH_{ist} + \lambda_i + \theta_t + \varepsilon_{ist} \quad (2)$$

The account fixed effects, λ_i, control for the propensity of different card holders to consume different items and spend different amounts. This allows us to control for family structure and other aspects of households that are not included in the limited set of covariates provided in the credit card data.[9] In our sample, we have an average of 96 observations per account.

We link the STHs for specific types of items with the merchant categories where we would expect the items to be sold; see the Appendix for the exact mapping we employ. In the table, we show estimates of β_1 for the different STH – merchant category combinations. Similar to the previous table, we also calculate the increase in spending as a fraction of average daily spending in that category and show this calculation at the bottom of the table. We find an increase in overall spending of $1.33 or 8% of daily spending during STHs and large increase in spending on apparel and in its subcategories during clothing and footwear holidays. In particular, we find that overall apparel spending increases by $0.76, or 65% relative to daily average spending on apparel. The effects for STHs on computers and appliances are imprecisely estimated; this may be because among the numerous items in these categories, only computers were exempt from taxes in the five 2003 STHs that exempted any appliances. In addition, many purchases of computers were made online (32% in 2002, Wagner 2003) allowing individuals an alternative means of avoiding taxes. If this is the case, the STH on computers may serve to affect the outlet from which a computer is purchased rather than the decision to purchase a computer. We cannot capture this change in outlet using our data because we don't know merchant location. Unlike in the Dairy data, we find large increases in spending at book and school supply merchants for STHs that exempt these item,. For STHs exempting home goods, we find large and negative results for furnishing stores and large and positive results for big box retailers. Only one of our STHs (in South Caroline) covers home goods and only a small set of goods in this category are exempt – sheets and towels – which would explain an effect close to zero.

[9] We also performed all of our analysis including controls for age, age squared, income, income squared, FICO score, a co-applicant flag, and state of residence. The results were substantively similar. See Agarwal and McGranahan (2011).

These finding may be driven by consumers choosing to shop at big box retailers where they can also purchase the other items that are exempt during the holiday. We find a small, insignificant increase in spending on other goods. Going forward, we will limit our focus to STHs exempting clothing and shoes, school supplies and books as these are the items where we find the cleanest results.

Based on these results we calculate price elasticities for the apparel subcategories, big box spending, and for books and school supplies, and present the results in Table 8. Suprisingly, these elasticities are very similar to those we found based on the Diary data. In this data set, we may have expected to find smaller estimated elasticies because we are over-estimating the price change, since our estimates assume that the sales tax is removed on all goods in the category. However, many items in some of these merchant categories are not covered by the sales tax holiday.[10] We also break these elasticities down into intensive and extensive margins. The results for clothing are similar to the Diary data, but we find all of the change in shoe consumption to be occurring on the extensive margin.

4.2 Heterogeneity Within and Across Households

Given that STHs are justified based on their ability to help working families with children, we are interested in which individuals within the household benefit from this increased consumption and which types of households increase their consumption most dramatically. We are particularly interested in differences based on the presence of children and household income.

4.2.1 Children and Children's Clothing

The Diary data allow us to investigate directly whether STHs cause an increase in the consumption for adults or children (15 or under). We are not able to disaggregate school supplies in a similar manner, nor are we able to do a similar exercise with the credit card data. A significant political motivation behind STHs is the need to provide children with new apparel. Examining whether parents respond to an STH by increasing their children's consumption or their own indicates whether STHs are effective as a policy mechanism to increase consumption of targeted goods.[11]

Table 9 displays regressions disaggregating the clothing and shoe items into those purchased for men, women and children.[12] The results reveal that the increases found in consumption of

[10] For example approximately 45% of department store spending (as measured in our clothing category) is for clothing and about 20% of big box spending is on apparel. These estimates of coverage come from the Annual Reports of Nordstrom Inc. (2001), Target (2011) and Wal-mart Stores, Inc (2012)

[11] The difficulty for retailers to determine whether an item is explicitly meant for children is likely the primary reason why STH rules do not simply make only children's apparel eligible for tax exemption.

[12] The "clothing, shoes and jewellery" section of the Dairy asks respondents to report for whom the item was purchased. Our breakdown between men's, women's and children's purchases is based on data reported based on these responses. Children are individuals aged 15 or under. The children category includes infant apparel.

clothing and shoes on days that have an STH are concentrated on children's items. Men's and women's apparel exhibit no statistically significant increase in spending on STHs, although most of the point estimates are positive. On average, households increase the amount spent on children's clothing by $0.98 and on children's shoes by $0.62. These results suggest a substantial increase in consumption relative to average daily expenditures; in percentage terms, these effects account for a 100% and 248% increase respectively. Given these household responses, STHs appear to support policymakers' stated objective of encouraging spending on school-age children, often right before the academic year begins.

We next investigate how the consumption response to STHs differs among households with different familial compositions. Using the Diary data, we replace the STH variable with interactions between the STH dummy and different family composition variables displayed in Table 2. We also add a control for the higher back to school shopping propensities of families with children. Our underlying equation becomes:

$$y_{ist} = \beta_0 + \sum_{g=1}^{G} \beta_g \times D_{ig} \times STH_{ist} + \lambda \times BTS\_kids_{it} + \gamma \times X_i + \theta_t + \varepsilon_{ist} \quad (3)$$

Where D_{ig} is a dummy variable indicating membership of household *i* in household composition group *g* and β_g the coefficient indicating how the STH effects spending among members in the group g. BTS_Kids_{it} is a dummy variable equal to 1 if the observation occurs during August and the household contains children and λ the coefficient capturing the different propensity of households with children to back to school shop.[13] In table 10, we show coefficients, β_g, for the five different household composition types: single households; households consisting of one parent with children; married households with children; married households without children and "other" households for spending on shoes, clothing, school supplies, kids clothing and kids shoes.[14] At the bottom of the table we show these coefficients as a fraction of average daily spending in each expenditure category among households in every composition group. Our main finding reveal that households consisting of a married couple and their children increase their clothing consumption and children's clothing consumption the most during sales tax holidays. For these households, clothing consumption increases by $5.23 or 85%. The next largest effect is for single parent households, who increase clothing consumption by $3.66. The pattern for shoe spending is quite similar. For school supply spending we find negative effect for single parent households and other households.

[13] Different parameterizations of the back to school variable lead to similar results.
[14] We combine married with young children and married with old children together. "Other" households are those that include individuals outside the nuclear family of the household head.

We next perform a similar analysis using the credit card data. To compensate for the fact that this data set does not contain information on family structure, we procede in two ways. First, we divide the sample by age group and investigate whether the effects of STHs on spending differ by age group. We view this as a control for the presence of children because card holders in the middle ages are more likely to have children at home than older and younger households. According to the Census Bureau, in 2003, 56% of householders aged 24 or below had own children in the household, 76% of those 25-34, 86% of those 35-44, 68% of those 45-54, 34% of those 55-64, and 23% of those 65 plus. (U.S. Census Bureau, 2004). We also add a series of dummy variables with the interaction between a dummy equal to 1 if the observation occurs in August and the age group dummies to control for different propensities to back to school shop for each age group. Results are presented in Table 11. At the bottom of the table, we calculate the increase in spending as a percent of average daily spending among households in each age group. We find that the only group where apparel spending does not increase is individuals 65 and over, while the increase for those 55-64 is statistically insignificant. In percentage terms, the largest increases in apparel spending are among those ages 35-44, which is the age group most likely to have kids. For the school supply holidays, we find large increases for the under 25 group, which likely contains many college students, as well as for the 45-54 age group.

Our second method of investigating the effect of the presence of children replaces the age group dummies with the probability that households in that age group have children (according to Census data) and investigate whether households that are more likely to have kids have larger STH spending effects. The equation we estimate is:

$$y_{ist} = \beta_0 + \varphi \times STH_{ist} \times \Pr(kids) + \sum_{g=1}^{G} \lambda_g \times D_{ig} \times BTS_t + \lambda_i + \theta_t + \varepsilon_{ist} \quad (4)$$

In particular, we replace the STH-age group interactions with an interaction between the sales tax holiday dummy variable and the measure of the probability that the household has kids. We also add separate back to school dummies ($D_{ig} \times BTS$) for three probability groups – those with 0-14% likelihood of having kids, those with a 22-46% likelihood of having kids, and those at least 56% likely to have kids. Our goal here is to investige whether households that are more likely to have kids have larger expenditure effects during tax holidays, controlling for their higher propensity to consume during back to school season. These results are presented in Table 12. At the bottom of the table, we present tabulations of average increases in spending for groups of households based on the probability of having kids and these increase as a percent of average daily spending among households in that group. For all of our spending categories, we find significantly larger spending increases among those more likely to have kids.

Using our two data sources, we find that households with children appear to have the strongest consumption responses to STHs and that much of the increased apparel spending is on items for kids. These findings are consistent with some of the main stated political objective of the STH.

4.2.2 Income

To justify the enactment of STHs, much of the political rhetoric focuses on the consumption needs of children, particularly those in lower-income, working class households. While policymakers might want to target the tax relief of STHs to households in these demographic groups, this goal has proven to be very difficult, if not impossible, given the current designs of STHs. Since retailers do not have methods in place to verify the income level or household composition of customers in order to charge different sales tax rates on the same items, there is little policymakers can do to incentivize households of different backgrounds differently.[15] Further, there are reasons why lower-income households may be less likely to reap the benefits of STHs. In particular, households with more financial resources may be better able to time consumption to take advantage of STHs.

In Table 13, we show estimates of equation 3 using the Diary data where the groups, D_{ig}, are income groups rather than household composition groups for three different income categories: those with income below $30,000, those with incomes between $30,000 and $70,000, and those with incomes above $70,000.[16] We do not control for different back to school spending propensities of individuals in different income groups because we don't find evidence that there are major differences. At the bottom of the table we display estimated increases in spending as a fraction of average spending among households in each income group. We find positive point estimates for the overall clothing and shoe expenditures, although the only significant results are for spending by the highest income households on shoes. We see large increase in spending for children's clothing and shoes which is statistically significant for the highest income categories for both items, and for the lowest income category for shoes. In percentage terms, there is no consistent ordering of the effects. The point estimates for school supplies are mixed in sign and always insignificant.

For the credit card data, we group households into income quartiles based on the income data and replace the STH dummy with four variables measuring the interaction between the STH dummy and the income quartile dummies. We divide income differently than in the Dairy data because the sample contains a higher income population. The results are presented in Table 14. In the bottom of the table, we calculate the estimated increase in spending for each income group merchant category combination as a fraction of average daily spending in that merchant category among households in that income category. For apparel spending, we find statistically

[15] Retailers charge different legislated sales tax rates on different goods, and can discriminate based on payment methods. For example Food Stamp purchases are not subject to sales tax and merchants can offer a discount for the use of cash.

[16] Controlling for these propensities leads to substantively similar results. These dollar delineations were kept constant for every CEX survey between 1997 and 2008; for example, the group consisting of households earning below $30,000 includes both households earning below $30,000 1997 dollars for the 1998 CEX and households earning below $30,000 2007 dollars for the 2008 CEX In other words, these are nominal rather than real break points..

significant increases for all income groups, with the dollar increases largest for the bottom two income quartile groups. In percentage terms, the increases are generally monotonically decreasing as income increases. For the STHs on school supplies, we see higher school supply spending that is statistically significant only for the top quartile, but percentage-wise, we see substantial increases in our bottom income group. We suspect that many of the individuals in the lowest income quintile are college students which may explain some of this finding. [17]

Our results for income are more mixed than those for the presence of children as we do not see a consistent pattern across the two samples as to which group's spending increases the most. [18]

4.2.3 Tax Savings

Up to this point, our analysis has focused on the marginal effects of STHs on households' consumption. We have investigated whether STHs lead to additional spending, and our main findings show large marginal effects on consumption. It should be noted, however, that STHs also subsidize the consumption of eligible items when households do not make any *additional* purchases as a result of the STH. Tabulating the household types that purchase eligible items during STH periods is important in understanding which household benefits from this tax subsidy.

Table 15 presents the average August daily expenditures on clothing, shoes, and school supplies and the sum of these for eight population groups defined first by household composition and then by income based on the Diary data. These tabulations are for households in states without an STH and for households for in states with an STH only on those days where there is not an STH. We choose August expenditure because it is the most popular month for STHs. We exclude STH dates to isolate average spending independent of the influence of a tax holiday. In the final column of the table, we calculate the average tax saving that these households would receive were their spending tax-free.[19]

Perhaps expectedly, the amount spent on STH eligible items increases monotonically in income, with the households earning under $30,000 spending on average $4.04 per day while households earning over $70,000 spend $11.57 on average per day. If households were not to increase their spending in any way during a sales tax holidays, the wealthiest households would save nearly three times as much in sales taxes ($0.58) as the poorest households ($0.21).

[17] We also investigated heterogeneity across sales tax holidays policy parameters including duration, price ceiling and the percentage savings due to the sales rate and did not find any statistically significant results. The variation across these parameters is fairly small which may explain our inability to detect patterns.
[18] We also investigated heterogeneity across holidays to see whether there was a different consumption response based on the length of the holiday or the level of the suspended tax. We found few differences across these dimensions probably because there is not a lot of variation. Details are in Agarwal and McGranahan (2011).
[19] This calculation is based on the tax rate of the state where the households live.

Among the household composition categories, the households with high spending on STH items in August are households with children: both single parent households and married households with children. Households in these two groups spend over $10 on tax-exempt items on the average August day.

Table 15 illustrates that even in the absence of any stimulative effect, STHs are only partially effective at helping subsidize the intended recipients. While households with children shop the most for eligible items during the period when STHs occur, lower income households spend less than the highest income households.

In Table 16, we display similar calculations for the credit card data. We show results by income and age group. These tabulations also highlight that the largest tax savings accrue to the wealthiest households, since they spend the most on exempt items on average. When we investigate spending by age group, we find that spending on apparel is highest among those households most likely to have kids. Spending on school supplies is highest among the youngest categories, which likely includes many college students. The correlation between tax savings and the probability of having kids is over 0.8. These tabulations show that this data set also points to the largest savings among those households that are most likely to have children and who are highest income.

4.3 Spending Across Time

We have found evidence that individuals increase spending on covered goods during STHs. We next are interested in whether this increase in spending during STHs is offset by declines in spending before and after the sales tax holidays. The timing and brevity of STHs provides households with the incentive to defer the consumption of items that will be tax-exempt during an STH. In addition, the large estimated price elasticities suggest that consumers are responding to something in addition to the small change in price.

For durable goods and semi-durable goods like apparel and shoes, purchases today may be a substitute for purchases tomorrow. As a result, we might expect increases in purchases during the STH to be partially offset by declines in purchases before or after the holiday. Empricially, studies of stockpiling in response to sales promotions finds evidence that consumes do stockpile (Hendel and Nevo (2004)). Further, Hendel and Nevo (2006) apply a model of consumer inventory holding to scanner and household-level data and find that when households make purchases during sales they are more likely to postpone their next purchase. Conversely, households may consume more in the period following an STH due to "momentum effects"--the phenomenon where shopping leads to more shopping. The head of the Retailers Association of Massachusetts suggested that the states STH would build consumer momentum, asserting that

shoppers are more likely to return to a store after shopping during a holiday (Woolhouse, 2010).[20]

We are interested in whether households increase their consumption or merely alter the timing of planned consumption to take advantage of the holidays. One of the frequent concerns about STHs is that they primarily alter the timing of consumption rather than its level. Given that neither school supplies nor apparel are perishable, we may expect households to respond to the holiday by moving consumption into the holiday window from the periods before and after. If this is the case, the holidays do not lead to increased consumption of covered goods.

In order to test whether households alter consumption in periods before and after the STH, we estimate the following equation:

$$y_{ist} = \beta_0 + \beta_1 \times STH_{ist} + \sum_r \beta_r \times STH\_Pre_{istr} + \sum_l \beta_l \times STH\_Post_{istr} + \gamma \times X_i + \theta_t + \varepsilon_{ist} \qquad (5)$$

Equation (5) is nearly identical to equation (1), but equation (5) includes indicator variables denoting dates either preceding (STH_Pre) or following (STH_Post) an STH. The identification strategy is same as that used in equation (1); by still including the calendar date fixed effects, the variables STH_Pre and STH_Post examine the consumption patterns of households on the same calendar dates in states with an STH with those in states without one—the only difference is that instead of focusing on STH dates, we now extend our analysis to dates before and after the STH.[21]

For household *i* in state s, STH_Pre_{istr} is equal to 1 if our household date covers expenditures in a week or month *r* prior to the STH at date *t* ; STH_Post_{istr} is defined in an anologous manner, only for periods after the STH. We analyze different windows, but only present results for the period two weeks before and after[22].. Note that the same households are unlikely to be observed before, during, and after an STH in the Diary sample because households are only in the sample for a maximum of two weeks.

Table 17 presents the coefficients for STH_Pre, STH_Post, and STH with spending on children's clothing and shoes as our explanatory variables. The coefficients presented represent the average increase in *daily* spending for days that are within the period listed. We restrict our outcome variables to children's clothing and shoes because these are the categories where we found the strongest effects, and we expect any consumption shifting to affect these categories. When we look at spending by week, we do not see any statistically significant changes in the two weeks prior or proceeding the STH. To supplement our analysis, we include two calculated

[20] See also Dhar et. al. 2007.
[21] We also drop state of residence from our set of covariates. We describe the rationale for this decision in more detail in the discussion
[22] According to tabulations from Google Trends, few news articles and searches on STHs occur prior to the start of this two week window. Further, results for other windows lead to similar conclusions.

statistics (and associated P-values) at the end of each table. First, we present the average change in daily spending in the days before and after the STH labelled "Average Day Before and After". This is a test for whether the STH alters consumption in the period before or after the STH. If there is offsetting behavior, this coefficient would be negative. Second, we present the "Sum of STH effects" which measures the total change in spending before, during and after the STH. This asks whether consumption as a whole changes in response to the STH. To calculate this, we add the change in consumption before and after to the change during the STH. To estimate the change during the holiday we multiply the STH effect by the average duration of STHs and each of the weekly coefficients by seven. If there were no change in consumption, we would expect this sum to be modestly negative to capture the drop in the after tax price.

The average point estimates for the weeks before and after the STH are positive for both clothes and shoes and statistically significant for children's shoes. The sum of the STH effects is also positive for both spending categories and only significant for children's shoes. We do not see any evidence that declines in spending before and after the holiday offset the increases during it. If anything, we see increases in spending in the period around the holiday.

Fortunately, the larger sample sizes in the credit card data offer an additional opportunity to investigate this issue. We perform the same analysis for the same window and report the results in Table 18. We estimate this controlling for the covariates listed in Table 4 and exclude state fixed effects and account holder fixed effects. We do this because controlling for either account or state fixed effects allows the STH to change the distribution of spending over time but not the overall level of spending in states with STHs or households in STH states. This occurs because because account or state fixed effects control for the average level of spending in a category over the time frame covered by the data. With fixed effects, changes in spending over all of the days in the sample in STH states would need to sum to zero, which is contrary to our interest in allowing the changes in spending in states with STHs or households in STH states to be different from zero over our sample period.[23]

At the bottom of the table we display the same test statistics and associated P-values that we displayed for the Diary data. Based on this table, we also find that there is no evidence of individuals shifting apparel or school supply consumption from the periods before or after the sales tax holiday into the sales tax holiday period. For apparel and school supplies the average change before and after the holiday is positive and statistically significant, as is the sum of the STH effects. We investigate this further by restricting our sample to individuals ages 25-54 who purchased apparel with their credit card at some point in the sample window and find a similar pattern of results.

[23] We also estimated these equations omitting the day after the STH ended because we were concerned that some payments during the STH would be processed and reported the next day. This does not alter our general conclusions, but we do observed high spending levels the day after the STH ends.

We next investigate changes in apparel spending over a broader set of windows. In Table 19, we show regressions of apparel spending beginning with just the STH period, and then successively expand by one week in each direction until we investigate the period eight weeks before and after the STH. At the bottom of the Table, we show the sum of the STH effects and its p-value. Based on these tabulations, up until the period five weeks before and after the sales tax holiday, we continue to see positive and significant STH effects. These effects are positive, but no longer significant for the periods six, seven, and eight weeks in either direction.

4.4 Robustness

4.4.1 Alternative Control Groups

The large number of positive coefficients before and after the STH is somewhat concerning. Negative numbers before and after the holiday would be consistent with shifting behavior. Zero before the holiday and positive numbers after would be consistent with momentum shopping, where shopping begets more shopping. However, it is hard to develop a theory as to why individuals would increase their shopping of covered goods in anticipation of a sales tax holiday.

The pattern of positive (albeit predominately insignificant) coefficients in the periods around sales tax holiday raises the concern that we are picking up seasonal demand patterns. In particular, we worry that the sales tax holidays are deliberately placed during periods of state-specific peak seasonal demand. If this is the case, we maye be picking up the correlation between seasonal demand and spending rather that the effects of the STH itself. This concern is somewhat allayed by the fact that the effects during the brief holiday window are substantially larger than the effects before or after. However, this general seasonal demand pattern may be biasing our coefficients up.

Sales tax holidays tend to take place in August during the back to school shopping season. At this time of year, seasonal demand patterns would likely be related either to the timing of the start of school or to weather patterns and the need to switch into a warmer wardrobe at different times in different locations. If there are seasonal demand peaks, then our control group is not the right one. Shoppers in a STH state should be compared with shoppers in other states without a STH on the same date who are subject to the same demand patterns. To account for the potential mismatch in our control group, we develop three alternative control groups using the credit card data. We compare consumers in STH states to others in states without a STH in the same region, to others living in zip codes with the same average August temperature, and to others in states which start school in the same general time frame.

To compare states with holidays to other in the same region, we divide states into the four major census regions and compare spending among individuals in states with STHs to those in other states without STHs in the same region on the same date. In short, instead of date fixed effects, we now have region-date fixed effects. To compare states with holidays to others in the same

August temperature range, we divide zip codes into three groups, those with average August temperature above 71.2, between 71.2 and 75.2, and above 75.2.[24] We then replace date fixed effects by temperature group-date fixed effects. For our final alternative control group, we divide states based on the typical start date of school districts in the state. In most states, school start dates are determined at the district rather than the state level.[25] We determine the typical start of the 2003 school year based on data from the Council of Chief State School Officers (CCSSO 2004) and divide states based on the midpoint of the range of dates provided by the CCSSO. Data is only provided for 43 of the 50 states, and for DC. Due to the lack of start date information, we lose one of our sales tax holiday states, New York, as well as California.

Results for apparel spending using our original control group and these three alternate control groups for two weeks before and after the holiday are presented in Table 20 for apparel and Table 21 for school supplies. Across these three different alternative control groups, we don't see any evidence of consumers shifting spending from the period before and after the STH into the holiday window. The point estimates for before and after the holiday continue to be positive on average.

In neither the Diary nor credit card data do we find declines in spending outside the STH period that offsets the increase during it. Further, the findings in the credit card data are robust to using other control groups. There are a number of ways to interpret this finding. First, STHs may lead to no change in spending over a longer window than we are able to assess with these data sources. If the decline in spending is very extended, covering the multiple month period that these items last, we would have trouble capturing it. This suggests both a high EIS and an extended response period. Second, the STH may lead to an increase in consumption during the sales tax holiday that is not offset. In this case, individuals in STH states buy more items because of the STH. This could occur either because the price elasticity of these items is extremely high, which seems unlikely, or because the STH itself induces spending that the household would otherwise not engage in..

4.4.2 Placebo Sales Tax Holidays

As an alternative way to investigate whether state specific demand patterns are influencing our results, we perform a counterfactual experiment using the Diary data. Focusing on the years before STHs were introduced, we analyze how individuals in a state behave on days that would eventually have an STH in their state. We label these "simulated" STHs. This experiment is valid if we assume that timing of state-specific demand shocks is invariant across years. Finding households in a state increasing consumption during days that in later years would have a STH

[24] Here we are taking advantage of the fact that we have information about card holder zip code, which we link to national weather service data for the nearest weather station.
[25] Some states restrict the choice of the district by mandating that schools must start after a certain date, other states leave start dates completely at the discretion of the district.

would be indicative of unobserved demand shocks influencing the decision to purchase, providing suggestive evidence that our main findings may be biased.

The main challenge of this approach is determining exactly when to assign the simulated STH. STHs are not on the exact same calendar date in a state each year but rather vary slightly year to year. We simulate STHs by taking the most recent sales tax in our data for each state listed in Table 1 and project it backwards based on the month, day of week and week of month when it began and its duration. This is consistent with the enacting legislation in many states which specify the timing of holidays in this manner. For example, in 2011 Connecticut had a tax holiday from Sunday August 21- Saturday August 27. Using our assignment rule, we simulate a holiday for Connecticut from Sunday August 18-Saturday August 24, 1996. Connecticut legislation (Conn. Gen. Stat §12-407e) states that the STH will start on the third Sunday in August and last a week. We label these "recent" STHs, and test the effects of these simulated STHs for the period 1994–1996. We are restricted to these dates because state identifiers are first introduced in the public use CEX in 1994.

Table 22 summarizes the results of running model (1) on the simulated STHs. The first panel in the Table reproduces the results from Tables 5 and 9, and the second panel in the Table shows estimates for the simulated holidays. The findings of this experiment suggest that our main results are indeed driven by the temporary suspension of sales taxes during STHs and not by the heterogeneity of seasonal demand across different states. In those instances where the coefficient on the actual STH shows a statistically significant increase in consumption, the regressions using the simulated STHs show no corresponding positive significant response. In fact, a couple of our coefficients are negative and significant. This may indicate that STHs are placed during times when demand is relatively weak.[26]

4.5 Border Spillovers

Another issue we encounter underestimating the difference in spending between states with and without STHs on a given day because the spending of individuals who live in states without a STH may also increase due to the holiday if they choose to cross the border and shop in the STH state. Our data on spending are based on the state where the household resides, not where it shops. We address this in the Diary data by deleting observations from states bordering a state with an STH on STH days thus restricting our control group to households in states that are not bordering a state with an STH. Our point estimates for clothing and shoes increase slightly, while the point estimate for school supplies falls. In all three cases, the change in the estimate is small when compared with our standard errors. Our conclusions are unaltered.

[26] As an additional check, we also created 100 random sales tax holidays in the credit card data. The estimated coefficients for the actual holidays are outside the 95% confidence interval for the random coefficients for clothing and kids clothing spending and outside the 90% confidence interval for total spending.

We address this in the Credit Card data by deleting observation from individuals in zip codes located within 17 miles of a state with a sales tax holiday. We choose 17 miles because the average passenger car in the US travelled 34 miles in the average day in 2003. (U.S. Department of Transportation 2003). Our point increase modestly for nearly all of the expenditure categories, but in no case can we reject that the coefficients are unchanged.

The large sample sizes and zip code information in the credit card data also allow us to investigate whether individuals who live in a zip code near a state with a STH also increase their spending during STHs. We investigate whether STHs lead to increased spending among individuals who live in a state without a STH, but in a zip code within 17 miles of a state with a STH. Results from estimating the increased consumption of households living just over tax holiday state borders are presented in Table 23. We find increased total spending and clothing spending among households just over the border during tax holidays. These increases in spending are slightly smaller than the increases within the tax holiday states. For example the average consumer in a tax holiday state increases apparel spending by $0.68, while the average consumer living across the border increases spending by $0.45. We can't be sure whether this increase in spending is occurring in the holiday state because we do not have information on merchant location. However, these findings are consistent with the conjecture that the tax holiday policy increases spending in holiday states by out of state individuals.

5. Conclusions

We investigate the spending response to state sales tax holidays and find that individuals in STH states dramatically increase their consumption of covered goods during the short sales tax holiday window. The small price drops and large consumption increases yield price elasticities far in excess of those found previously in the literature.

Our main finding show that the consumption responses are largest for households with children and apparel items purchased for children. We do not find clear patterns for whether higher or lower income households respond more to the temporary price change.

While critics of STHs have suggested that the holidays serve to alter the timing of purchases rather than the total amount purchased, we do not find evidence of this in our data. We postulate that we do not find shifting either because it occurs over a longer time horizon than we are able to capture using our data or because this shifting does not take place and households increase their consumption in response to the sales tax holidays. In either case, we find that consumption is extremely responsive to these short term price changes.

Appendix: Transaction Data Appendix

Any user initiated credit card activity is referred to as a transaction. Transaction data is transmitted from the point of purchase to a central clearinghouse. There are several

clearinghouses throughout the US. The major clearinghouse is First Data Resources or FDR. FDR provides monthly summaries of transaction data to the credit card issuers.

The transaction data file includes many fields (such as exact time of transaction) but the ones used for this study are transaction amount, card account number, and Merchant Classification Code or MCC. Merchant Category Codes (MCCs) are codes established by the bankcard associations or banks to identify different types of businesses. The MCC is a 4-digit code selected by the merchant, with the merchant selecting codes that best describes their business. The MCC identifies the merchant by type of processing, authorization and settlement.

Since the only knolwegde available for identifying items purchased is limited to MCCs, we employ the following mapping to STH exempt status. For STHs that exempt clothing and shoes, we look at spending on apparel, clothing, kids clothing, shoes, other apparel, and at big box merchants.[27] For STHs that exempt appliances or computers, we look at spending on appliances and computers, and at big box merchants. For sales tax holidays that exempt school supplies, we look at spending at book and school supply stores and at big box merchants. For STHs that exempt home furnishings, we look at spending at home operations, furnishings merchants (a part of non-apparel, other) and at big box retailers. For total spending and other we include STHs on any item. Most sales tax holidays exempt clothing and shoes, but only a few exempt each of the other items.

[27] We do not separate clothing and shoe holidays because all of the holidays in 2003 that exempt clothing also exempt footwear.

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Table 1: Sales Tax Holidays in 1997-2011 Diary Sample

State	Days	Items Included - Max Allowable Cost	1st Year	Most Recent
Connecticut	7	clothing and footwear - $300	2001	2011
District of Columbia	9	clothing and footwear- $100	2004	2009
		school supplies - $100		
	17	clothing and footwear - $100	2004	2009
Florida	3	school supplies - $15	1998	2011
		books, clothing and footwear - $75		
Georgia	4	school supplies - $20	2004	2009
		clothing and footwear - $100		
		computer - $1,500		
		energy and water efficient products - $1,500	2006	
Illinois	10	clothing, footwear & school supplies - $100	2010	2010
Louisiana	2	all tangible personal property - $2,500	2007	2011
	2	hurricane preparedness items - $1,500	2008	2011
	3	firearms, ammunition and hunting supplies	2009	2011
Maryland	7	clothing and footwear - $100	2010	2011
	3	energy star products	2011	2011
Massachusetts	2	all tangible personal property - $2,500	2008	2011
New York	7	clothing and footwear - $110	1997	2006
North Carolina	3	clothing and footwear - $100	2001	2011
		school supplies - $100		
		instructional material - $300		
		computers - $3,500		
		other comp. - $250		
		sports equip - $50		
	3	energy star products	2009	2011
Pennsylvania	8	personal computers and accessories	2000	2002
South Carolina	3	clothing and footwear	2000	2011
		school supplies		
		computers		
		other		
Tennessee	3	clothing and footwear - $100	2006	2011
		school supplies - $100		
		computers - $1,500		
Texas	3	clothing, footwear, backpacks and school supplies- $100	1999	2011
	3	energy star products	2008	2011
		air conditioners - $6,000; other - $2,000		
Vermont	1	Personal Purchase - $2,000	2008	2010
Virginia	7	hurricane preparedness items - $60	2008	2011
		generators - $1,000		
	3	clothing and footwear - $100	2006	2011
		school supplies - $20		
	4	energy star products - $2,500	2006	2011

Note: This includes all holidays in our Diary Sample. Holidays in states where the state code is suppressed in the Consumer Expenditure Survey are not included.

Table 2: Summary Statistics, Diary Data

	Unconditional Spending		Conditional (Non-Zero) Spending		Unconditional Spending
	Full Sample		Full Sample		Weekend in August Sample
	Mean	SD	Mean	SD	Mean	SD
Total Spending	$ 135.18	692.69	$ 191.78	818.46	$ 126.23	566.73
Exempt Spending	$ 6.09	39.49	$ 63.62	112.43	$ 7.52	45.78
Clothing	$ 4.20	30.84	$ 59.63	101.06	$ 4.84	33.68
Men's Clothing	$ 1.05	16.92	$ 52.30	107.58	$ 1.16	18.11
Women's Clothing	$ 1.96	20.01	$ 53.60	90.55	$ 1.93	17.01
Children's Clothing	$ 0.98	10.42	$ 38.25	53.11	$ 1.55	14.91
Shoes	$ 1.19	11.59	$ 52.50	56.84	$ 1.50	13.04
Men's Shoes	$ 0.38	6.54	$ 62.07	55.72	$ 0.43	6.80
Women's Shoes	$ 0.56	7.58	$ 45.70	51.47	$ 0.57	6.70
Children's Shoes	$ 0.25	4.57	$ 39.75	41.78	$ 0.50	6.95
School Supplies	$ 0.70	15.01	$ 32.35	96.78	$ 1.18	17.89
Other	$ 127.29		$ 210.85		$ 117.20	
Age Reference Person	48.50	17.10				
Family Size	2.57	1.51				
% Male	0.50	0.50				
% While	0.82	0.38				
% Single Household	0.27	0.45				
% One-Parent Household	0.06	0.24				
% Married No-Children Household	0.21	0.41				
% Married Young-Children Household	0.19	0.40				
% Married Old-Children Household	0.07	0.26				
% Other Household	0.19	0.39				
% Household Income<30K	0.34	0.47				
% 30K<Household Income<70K	0.36	0.48				
% Household Income>70K	0.31	0.46				
Observation During STH	3940					
Observation During Clothing/Shoe STH	2547					
Observation During School Supply STH	1433					
Observations	784993					

Notes: Spending on computers and clothing accessories is included in the total, but not in any of the subcategories of consumption. The unconditional mean is the daily mean for all households in the sample. The conditional mean is the daily mean among those households that make a purchase in the listed category on a given day. The weekend in August mean is the daily mean for those households observed on a Friday, Saturday, or Sunday in August. Dollar amounts in 2008 dollars.

Table 3: Sales Tax Holidays in 2003

State	Dates	Description	Local Participation	Relevant Spending Sub-Categories	State Tax Rate
Connecticut	8/17/2003-8/23/2003	Clothing and footwear priced $300 or less. (Normally no tax on clothing under $75)	No local sales tax	Clothing, Kids Clothing, Shoes, Big Box	6
Georgia	7/31/2003-8/3/2003	Clothing and footwear priced under $100, school supplies and children's books under $20, computers and computer accessories under $1500	Local sales taxes also repealed	Clothing, Kids Clothing, Shoes, Big Box, Books, Computers & Appliances	4
Iowa	8/1/2003-8/2/2003	Clothing and footwear priced $100 or less	Local sales taxes also repealed	Clothing, Kids Clothing, Shoes, Big Box	5
New York	8/26/2003-9/1/2003	Clothing, footwear and clothing repair items priced less than $110	Localities choose whether local sales taxes are repealed	Clothing, Kids Clothing, Shoes, Big Box	4
North Carolina	8/1/2003-8/3/2003	Clothing, footwear, and school supplies priced $100 or less, sports equiptment $50 or less, computers priced $3500 or less	Local sales taxes also repealed	Clothing, Kids Clothing, Shoes, Big Box, Books, Computers & Appliances	4.5
South Carolina	8/1/2003-8/3/2003	Clothing, footwear and school supplies, computers, bedding and bath items	Local sales taxes also repealed	Clothing, Kids Clothing, Shoes, Big Box, Books, Computers & Appliances, Home Furnishings	5
Texas	8/1/2003-8/3/2003	Clothing and footwear priced $100 or less	Localities choose whether local sales taxes are repealed	Clothing, Kids Clothing, Shoes, Big Box	6.25
Vermont	8/9/2003-8/11/2003	Computers and associated accessories up to $4000	Local sales taxes also repealed	Computers & Appliances, Big Box	5
West Virginia	8/1/2003-8/3/2003	Clothing, footwear, and school supplies priced $100 or less. Computers and accessories less than $750.	No local sales tax	Clothing, Kids Clothing, Shoes, Big Box, Books, Computers & Appliances	6
Data from Adam J. Cole, 2008					

Table 4: Summary Statistics, Credit Card Sample

	Full Sample			Back to School Sample	
	Mean	SD		Mean	SD
Total Spending	$ 17.39	129.16		$ 16.76	126.82
Apparel	$ 1.65	32.28		$ 1.58	31.34
Clothing	$ 1.22	22.71		$ 1.16	21.74
Kids Clothing	$ 0.06	3.50		$ 0.06	3.45
Shoes	$ 0.12	6.09		$ 0.12	6.18
Other Apparel	$ 0.24	21.37		$ 0.24	20.93
Non-Apparel	$ 15.75	124.60		$ 15.19	122.41
Big Box	$ 1.12	17.50		$ 1.10	15.89
Books and School Supplies	$ 0.26	9.62		$ 0.26	9.61
Appliances	$ 0.64	29.69		$ 0.62	29.16
Other	$ 13.72	118.81		$ 13.21	116.82
Age Account Holder	46.33	14.66		46.32	14.68
Income (Thousands)	71.52	128.03		71.12	126.47
FICO Score	740.50	67.34		739.23	70.11
% Co-Applicant Flag	0.35	0.48		0.34	0.48
Observations During STH	63370			63370	
Observations During Clothing/Shoe STH	63043			63043	
Observations During School Supply STH	8723			8723	
Observations	10303804			7076279	
Obs with Non-Missing Income	8089257			5576205	

Notes: Summary statistics represent the sample means, standard deviations and number of observations for the main dependent and independent variables used in the empirical analysis. The full sample covers the time period from February 8 - October 20, 2003. The back to school sample covers May 1-September 30, 2003. All dollar amounts are in (December) 2008 dollars.

Table 5: Baseline Results, Diary Sample

	(1)	(2)	(3)	(4)	(5)
	Total Spending	**Clothing**	**Shoes**	**School Supplies**	**Other**
STH on Any Item	13.66				12.21
	(10.24)				(10.15)
STH on Clothing/Shoes		1.17**	1.05***		
		(0.57)	(0.40)		
STH on Books/School Supplies				-0.1	
				(0.26)	
Total Effect/Mean[1]	0.10	0.29	0.88	-0.14	0.10
Total Effect/Aug Mean[2]	0.11	0.24	0.70	-0.08	0.10
Observations	784993	784993	784993	784993	784993
Robust standard errors in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					
Note: All regressions include controls for age, sex, and race of household head, household composition, income category and state of residence and are estimated with calendar date fixed effects. All dollar amounts are in 2008 Dollars					
[1]The Total Effect divided by the mean of the dependent variable					
[2]The Total Effect divided by the mean of the dependent variable restricted to weekends in August					

Table 6: Elasticities Based on Diary Sample

	Clothing	Shoes
Total Elasticity	-7.4	-21.1
95% CI	[-13.4,-1.3]	[-37.7,-6.5]
Extensive Margin	-4.6	-9.7
Intensive Margin	-2.8	-11.4
Percent Extensive	62%	46%
Percent Intensive	38%	54%

Note: Table 6 presents price elasticities based on the findings in Table 5 assuming a fall in after tax price equal to the removal of the average sales tax.

Table 7: Baseline Estimates, Account Fixed Effects, Credit Card Sample

	(1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	*(11)*
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Big Box	Appliances	Big Box	Books and School Supplies	Big Box	Home Operations, Furnishing & Maintenace	Big Box	Other
STH on Any Item	1.328***												0.365
	(0.241)												(0.281)
STH on Clothing/Shoes		0.760***	0.438***	0.102***	0.0980***	0.273***							
		(0.111)	(0.0887)	(0.0191)	(0.0334)	(0.0624)							
STH on Computers/Appliances							0.0804	0.345					
							(0.168)	(0.288)					
STH on Books/School Supplies									0.408**	0.356			
									(0.165)	(0.301)			
STH on Household Goods											-0.689***	1.919***	
STH Effect/Mean[1]	0.0792	0.653	0.376	1.838	0.819	0.249	0.129	0.315	1.546	0.325	-0.872	1.752	0.0277
Observations	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651	7,076,651
Robust standard errors in parentheses													
*** p<0.01, ** p<0.05, * p<0.1													

Note: Table 7 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. We include controls for whether there is a sales tax holiday on different items, calendar date fixed effects, and account fixed effects. All dollar amounts are in 2008 Dollars. Standard errors are clustered by state. The main independent variable of interest is the sales tax holiday indicator.

[1]STH Effect divided by the mean of the dependent variable

Table 8: Estimated Price Elasticities, Credit Card Sample

Covariates	Clothing/Shoe Holiday						School Suppy Holiday
	Apparel	Clothing	Kids Clothing	Shoes	Big Box		Books and School Supplies
Total Elasticity	-10.9	-8.7	-29.2	-16.0	-6.2		-48.2
95% CI	[-13.8,-8.0]	[-13.4,-6.3]	[-45.4,-21.1]	[-29.9,-6.5]	[-9.6,-4.2]		[-99.1,-11.2]
Extensive Margin	-7.2	-5.9	-21.6	-17.1	-2.4		-18.9
Intensive Margin	-3.8	-2.8	-7.6	1.1	-3.8		-29.3
Percent Extensive	65%	67%	74%	107%	38%		39%
Percent Intensive	35%	33%	26%	-7%	62%		61%

Note: Table 8 presents price elasticities based on the findings in Table 7 assuming a fall in after tax price equal to the removal of the average sales tax.

Table 9: The Distribution of Intra-Household Consumption of Clothing and Shoes, Diary Sample

	Clothing/Shoe Holiday					
	(1)	(2)	(3)	(4)	(5)	(6)
	Clothing-Men	**Clothing-Women**	**Clothing-Children**	**Shoes-Men**	**Shoes-Women**	**Shoes-Children**
Sales Tax Holiday	0.24	-0.01	0.98***	0.28	0.15	0.62***
	(0.23)	(0.30)	(0.34)	(0.27)	(0.15)	(0.22)
STH Effect/Mean[1]	0.23	-0.01	1.00	0.73	0.27	2.48
STH Effect/Aug Mean[2]	0.21	-0.01	0.63	0.65	0.26	1.25
Observations	784993	784993	784993	784993	784993	784993
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						
Note: All regressions include controls for age, sex, and race of household head, household composition, income category and state of residence and are estimated with calendar date fixed effects.						
[1]The Total Effect divided by the mean of the dependent variable						
[2]The Total Effect divided by the mean of the dependent variable restricted to weekends in August						

Table 10: Heterogeneous Household's Consumption of Clothing, Shoes and School Supplies

	Clothing/Shoe Holiday					School Supply Holiday
	(1)	(2)	(3)	(4)		(5)
Household Groups	**Clothing**	**Children-Clothing**	**Shoes**	**Children-Shoes**		**School Supplies**
STH*Single HH	-0.16	-0.10	-0.13	-0.06		0.55
	(0.530)	(0.147)	(0.241)	(0.072)		(0.628)
STH*One Parent	3.66*	4.00**	2.88	2.64*		-0.97***
	(2.202)	(1.994)	(1.913)	(1.522)		(0.230)
STH*Married w/ Children	5.23***	2.77**	3.15**	1.72**		-0.28
	(1.868)	(1.146)	(1.316)	(0.735)		(0.546)
STH*Married w/o Children	-0.72	-0.10	-0.27	-0.06		0.04
	(0.864)	(0.167)	(0.438)	(0.085)		(0.232)
STH*Other Family	-0.28	0.59	1.18	0.32		-0.48*
	(0.913)	(0.608)	(0.808)	(0.353)		(0.257)
STH Effect/Mean[1]:						
Single HH	-0.07	-0.72	-0.20	-1.81		1.71
One Parent	0.79	1.94	1.87	3.69		-1.27
Married With Children	0.85	1.30	1.87	3.23		-0.22
Married w/o Children	-0.18	-0.28	-0.27	-1.43		0.08
Other Family	-0.06	0.65	0.88	1.29		-0.73
Observations	784,979	784,979	784,979	784,979		784,979
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						
Note: All regressions include controls for age, sex, and race of household head, household composition, income category and state of residence and are estimated with calendar date fixed effects.						
[1] STH effect divided by the mean of the dependent variable for each group						

Table 11: Sales Tax Holiday Effects by Age Group, Account Fixed Effects, Credit Card Sample

	Clothing/Shoe Holiday									School Supply Holiday
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Other Apparel	Big Box	Other		Books and Supplies
Under 25 x STH	1.290	0.919*	0.286***	-0.0545***	0.117*	0.571	0.254**	-0.569		0.644***
	(1.358)	(0.527)	(0.0921)	(0.0134)	(0.0629)	(0.512)	(0.116)	(0.813)		(0.169)
Ages 25-34 x STH	-0.0579	0.563*	0.388*	0.0576	0.0827	0.0348	0.596***	-0.862		0.00210
	(0.880)	(0.323)	(0.225)	(0.0397)	(0.0830)	(0.0765)	(0.175)	(0.525)		(0.245)
Ages 35-44 x STH	3.782***	1.409***	0.692***	0.257***	0.183***	0.276***	0.247*	2.197***		0.909
	(1.191)	(0.216)	(0.148)	(0.0693)	(0.0288)	(0.0887)	(0.144)	(0.587)		(0.624)
Ages 45-54 x STH	1.761	0.964***	0.590***	0.114**	0.145***	0.116	0.380***	0.563		0.393***
	(1.275)	(0.240)	(0.151)	(0.0512)	(0.0349)	(0.128)	(0.105)	(1.051)		(0.136)
Ages 55-64 x STH	1.403*	0.338	0.321**	0.0753**	-0.0309	-0.0273	0.157	0.413		0.304
	(0.793)	(0.206)	(0.121)	(0.0297)	(0.0266)	(0.0554)	(0.155)	(0.640)		(0.319)
Ages 65+ x STH	-0.596	-0.0193	-0.0344	0.0122	0.0223	-0.0193	-0.0177	-0.285		0.00732
	(0.691)	(0.255)	(0.271)	(0.0390)	(0.0481)	(0.0467)	(0.0769)	(0.615)		(0.0228)
STH Effect/Mean[1]										
Age Under 25	0.0923	0.537	0.230	-0.952	0.783	2.192	0.280	-0.0556		1.636
Ages 25-34	-0.00315	0.287	0.276	0.834	0.587	0.101	0.482	-0.0609		0.00757
Ages 35-44	0.200	0.810	0.545	3.184	1.329	1.098	0.185	0.148		3.322
Ages 45-54	0.100	0.624	0.499	2.278	1.236	0.586	0.359	0.0402		1.353
Ages 55-64	0.0895	0.253	0.320	2.234	-0.328	-0.131	0.161	0.0328		1.250
Ages 65+	-0.0501	-0.0193	-0.0462	0.564	0.294	-0.120	-0.0229	-0.0296		0.0545
Observations	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129		6,955,129
Robust standard errors in parentheses										
*** p<0.01, ** p<0.05, * p<0.1										

Note: Table 11 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. We include controls for whether there is a sales tax holiday on different items, calendar date fixed effects, and account fixed effects. All dollar amounts are in 2008 Dollars. Standard errors are clustered by state. The main independent variable of interest is the sales tax holiday indicator.

[1] STH effect divided by the mean of the dependent variable for each group

12: Sales Tax Holiday Effects Based on the Probability of Having Children, Account Fixed Effects, Credit Card Sample

	Clothing/Shoe Holiday									School Supply Holiday
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Other Apparel	Big Box	Other		Books and Supplies
Sales Tax Holiday x Prob. Kids	3.928***	2.054***	1.121***	0.312***	0.266***	0.354***	0.742***	1.320**		0.996**
	(0.875)	(0.304)	(0.224)	(0.0641)	(0.0878)	(0.0711)	(0.168)	(0.513)		(0.375)
Average STH Effect[1]:										
Prob. Kids 0%-15%	0.151	0.0790	0.0431	0.0120	0.0102	0.0136	0.0285	0.0508		0.0370
Prob. Kids 22-46%	1.424	0.744	0.406	0.113	0.0964	0.128	0.269	0.478		0.251
Prob. Kids 59-66%	2.421	1.266	0.691	0.192	0.164	0.218	0.457	0.813		0.549
STH Effect/Mean[2]:										
Prob. Kids 0%-15%	0.0108	0.0658	0.0482	0.411	0.116	0.0725	0.0322	0.00451		0.188
Prob. Kids 22-46%	0.0838	0.453	0.330	2.189	0.768	0.548	0.257	0.0359		0.784
Prob. Kids 59-66%	0.127	0.690	0.521	2.365	1.168	0.758	0.341	0.0547		1.952
Observations	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129	6,955,129		6,955,129
Robust standard errors in parentheses										
*** p<0.01, ** p<0.05, * p<0.1										
[1] Average STH effect for households in that probability group.										
[2] Average STH effect divided by the mean of the dependent variable for each group										

Notes: Table 12 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. The table includes an interaction between the sales tax holiday indicator and the probability of having kids, calendar date fixed effects and account fixed effects. Standard errors are clustered by state. The main independent variable of interest is the interaction between the sales tax holiday indicator and the probability of having kids.

Table 13: Effects by Income Group, Diary Sample

	Clothing/Shoe Holiday					School Supply Holiday
	(1)	(2)	(3)	(4)		(5)
Income Groups	**Clothing**	**Children-Clothing**	**Shoes**	**Children-Shoes**		**School Supplies**
STH*Income < $30,000	0.12	0.45	0.66	0.73**		0.52
	(0.585)	(0.373)	(0.510)	(0.368)		(0.592)
STH*Income ($30,000, $70,000)	1.30	0.43	0.65	0.34		-0.28
	(0.839)	(0.419)	(0.458)	(0.307)		(0.204)
STH*Income > $70,000	2.30	2.34**	2.00*	0.84*		-0.46
	(1.408)	(0.913)	(1.032)	(0.486)		(0.392)
			.			
STH Effect/Mean[1]:						
Income <$30,000	0.05	0.78	0.84	4.02		1.55
Income ($30,000,$70,000)	0.35	0.49	0.57	1.46		-0.48
Income > $70.000	0.34	1.52	1.19	2.43		-0.37
Observations	784,993	784,993	784,993	784,993		784,993
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						
Note: All regressions include controls for age, sex, and race of household head, household composition, income category and state of residence and are estimated with calendar date fixed effects.						
[1] STH effect divided by the mean of the dependent variable for each group						

Table 14: Sales Tax Holiday Effects by Income Quartile, Controlling for Account Fixed Effects, Credit Card Sample

	Clothing/Shoe Holiday									School Supply Holiday	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Other Apparel	Big Box	Other		Books and Supplies	
Bottom Quartile (Q1) x STH	1.278	0.951***	0.681***	0.0382	0.0515	0.181***	0.0936	0.442		0.412	
	(0.835)	(0.178)	(0.143)	(0.0347)	(0.0334)	(0.0575)	(0.0849)	(0.649)		(0.251)	
Second Quartile (Q2) x STH	3.125**	1.001***	0.675***	0.133**	0.113***	0.0803	0.447***	1.651		0.000637	
	(1.307)	(0.183)	(0.0703)	(0.0569)	(0.0266)	(0.0818)	(0.141)	(1.442)		(0.179)	
Third Quartile (Q3) x STH	1.813	0.769***	0.349**	0.0968**	0.109*	0.214	0.108	0.752		0.0334	
	(1.797)	(0.196)	(0.153)	(0.0407)	(0.0552)	(0.130)	(0.125)	(1.864)		(0.0835)	
Top Quartile (Q4) x STH	-0.691	0.671**	0.388*	0.171**	0.186**	-0.0732	0.529***	-1.570*		0.447***	
	(1.052)	(0.299)	(0.198)	(0.0696)	(0.0861)	(0.0669)	(0.0779)	(0.783)		(0.132)	
STH Effect/Mean[1]:											
Q1	0.114	0.790	0.744	1.078	0.485	1.222	0.0992	0.0529		2.033	
Q2	0.218	0.758	0.685	3.451	1.126	0.408	0.400	0.148		0.00281	
Q3	0.102	0.487	0.302	1.667	0.897	0.871	0.0865	0.0538		0.124	
Q4	-0.0284	0.287	0.230	1.978	1.177	-0.179	0.429	-0.0806		1.219	
Observations	5,576,577	5,576,577	5,576,577	5,576,577	5,576,577	5,576,577	5,576,577	5,576,577		5,576,577	
Robust standard errors in parentheses											
*** p<0.01, ** p<0.05, * p<0.1											
[1] STH effect divided by the mean of the dependent variable for each group											

Notes: Table 14 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. Both tables include interactions between income quartile and the dummy for whether there is a sales tax holiday and calendar date fixed effects. Standard errors are clustered by state. The main independent variables of interest are the interactions between income quartiles and the sales tax holiday indicator.

Table 15: Average Daily August Expenditures on Exempt Items and Resulting Tax Savings, Dairy Sample

Household Type	**Clothing**	**Shoes**	**School Supply**	**Clothing + Shoes + School**	
Household Composition	$ Spent	$ Spent	$ Spent	$ Spent	$ Sales Tax
One Parent	6.32	2.51	1.83	10.70	0.53
Married-No Children	3.32	0.99	0.83	5.15	0.26
Married-Children	7.14	2.07	3.11	12.34	0.62
Single Households	1.93	0.70	0.66	3.31	0.17
"Other" Households	4.32	1.49	1.18	7.00	0.35
Income Groups					
Income < $30,000	2.24	0.88	0.79	3.94	0.20
Income $30,000-$70,000	4.21	1.41	1.35	6.97	0.36
Income > $70,000	7.21	2.03	2.69	11.96	0.59

Table 16: Average Daily August Expenditures on Exempt Items and Resulting Tax Savings, Credit Card Sample

Household Type	Apparel		School Supplies		Apparel + School Supplies	
Age Groups (Percent with Kids)	$ Spent		$ Spent		$ Spent	$ Sales Tax
<25 (56%)	$ 1.78		$ 0.63		$ 2.41	$ 0.11
25-34 (76%)	$ 2.08		$ 0.37		$ 2.45	$ 0.12
35-44 (86%)	$ 1.91		$ 0.35		$ 2.27	$ 0.11
45-54 (68%)	$ 1.65		$ 0.41		$ 2.06	$ 0.10
55-64 (34%)	$ 1.36		$ 0.30		$ 1.66	$ 0.08
65+ (23%)	$ 0.98		$ 0.14		$ 1.12	$ 0.05
Income Groups						
Bottom Quartile	$ 1.30		$ 0.30		$ 1.60	$ 0.08
Second Quartile	$ 1.39		$ 0.30		$ 1.69	$ 0.08
Third Quartile	$ 1.83		$ 0.39		$ 2.22	$ 0.11
Top Quartile	$ 2.42		$ 0.49		$ 2.90	$ 0.14

Table 17: Spending Two Weeks Before and After STH, Diary Sample, No State Dummies

	Clothing/Shoe Holiday	
	(1)	(2)
VARIABLES	Children's Clothing	Children's Shoes
2 Weeks Before STH	-0.24	0.10
	(0.245)	(0.18)
1 Week Before STH	0.03	0.05
	(0.273)	(0.11)
Sales Tax Holiday	0.95***	0.64***
	(0.340)	(0.22)
1 Week After STH	0.13	0.26
	(0.269)	(0.17)
2 Weeks After STH	0.13	0.19
	(0.269)	(0.12)
Average Day Before and After	0.05	0.15
P-Value	0.72	0.04
Sum of STH Effects	5.33	6.85
P-Value	0.21	0.003
Observations	784993	784993
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 18: Spending Two Weeks Before and After Holiday, Controlling for Covariates, No State Dummies

	Clothing/Shoe Holiday									School Supply Holiday	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Other Apparel	Big Box	Other		Books and Supplies	
2 Weeks Before STH	0.483	0.226	0.242**	0.0180	0.00875	-0.0429	-0.0949	0.131		0.0221	
	(0.519)	(0.154)	(0.0964)	(0.0122)	(0.0140)	(0.0900)	(0.0756)	(0.479)		(0.0245)	
Week Before STH	-0.184	0.0874	0.159*	0.00172	0.0139	-0.0867**	-0.138	0.0267		0.0657***	
	(0.523)	(0.120)	(0.0917)	(0.0129)	(0.00918)	(0.0396)	(0.0942)	(0.499)		(0.0203)	
STH	1.253**	0.912***	0.615***	0.0785***	0.131***	0.0876**	0.0724	0.332		0.197***	
	(0.504)	(0.0990)	(0.0774)	(0.0180)	(0.0338)	(0.0337)	(0.105)	(0.478)		(0.0361)	
Week After STH	0.0790	0.246	0.151	0.00357	0.0243*	0.0674	-0.102	-0.122		0.0491	
	(0.572)	(0.173)	(0.101)	(0.00689)	(0.0144)	(0.102)	(0.0909)	(0.488)		(0.0647)	
2 Weeks After STH	-0.153	0.0621	0.133	-0.00136	0.0111	-0.0811*	-0.0409	-0.252		0.0658*	
	(0.611)	(0.144)	(0.131)	(0.0193)	(0.0146)	(0.0406)	(0.113)	(0.461)		(0.0391)	
Average Day Before and After	0.0560	0.155	0.171	0.00549	0.0145	-0.0358	-0.0939	-0.0542		0.0507	
P-Value	0.898	0.0719	0.0380	0.616	0.0912	0.627	0.461	0.971		0.0291	
Sum of STH Effects	9.082	9.817	8.478	0.625	1.192	-0.478	-2.194	0.472		2.098	
P-Value	0.543	0.000443	0.000682	0.113	0.00128	0.280	0.270	0.884		0.00301	
Observations	5,443,579	5,443,579	5,443,579	5,443,579	5,443,579	5,443,579	5,443,579	5,443,579		5,443,579	
Robust standard errors in parentheses											
*** p<0.01, ** p<0.05, * p<0.1											

Note: Table 18 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. We include a sales tax holiday indicator, calendar date fixed effects, and separate indicators for the periods two weeks before and after the STH. Included covariates are age, age squared, income, income squared, fico scores, and a co-applicant dummy. Standard errors are clustered by state. The main independent variables of interest are the sales tax holiday indicator and the indicators for the weeks before and after the sales tax holiday.

Table 19: Dissipation of Effects of Clothing/Shoe Sales Tax Holiday on Apparel Spending, Controlling for Covariates, No State Dummies

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	Apparel	Apparel	Apparel	Apparel	Apparel	Apparel	Apparel	Apparel	Apparel
8 Weeks Before Clothing/Shoe STH									0.0237
									(0.158)
7 Weeks Before Clothing/Shoe STH								0.0874	0.0876
								(0.133)	(0.135)
6 Weeks Before Clothing/Shoe STH							-0.0683	-0.0673	-0.0670
							(0.0963)	(0.0974)	(0.0986)
5 Weeks Before Clothing/Shoe STH						0.141*	0.140*	0.141*	0.142*
						(0.0704)	(0.0708)	(0.0719)	(0.0738)
4 Weeks Before Clothing/Shoe STH					-0.0544	-0.0528	-0.0539	-0.0515	-0.0507
					(0.106)	(0.107)	(0.108)	(0.111)	(0.116)
3 Weeks Before Clothing/Shoe STH				0.358**	0.358**	0.360**	0.358**	0.360*	0.361*
				(0.174)	(0.174)	(0.174)	(0.175)	(0.180)	(0.180)
2 Weeks Before Clothing/Shoe STH			0.228	0.233	0.232	0.236	0.233	0.233	0.233
			(0.153)	(0.151)	(0.150)	(0.150)	(0.151)	(0.150)	(0.150)
1 Week Before Clothing/Shoe STH		0.0843	0.0875	0.0968	0.0952	0.0999	0.0996	0.0998	0.0997
		(0.120)	(0.122)	(0.133)	(0.135)	(0.138)	(0.138)	(0.138)	(0.139)
Clothing/Shoe STH	0.918***	0.922***	0.924***	0.929***	0.927***	0.925***	0.925***	0.925***	0.924***
	(0.0976)	(0.0985)	(0.0982)	(0.0991)	(0.105)	(0.105)	(0.105)	(0.105)	(0.105)
1 Weeks After Clothing/Shoe STH		0.226	0.230	0.248	0.247	0.242	0.240	0.240	0.240
		(0.176)	(0.174)	(0.180)	(0.181)	(0.182)	(0.182)	(0.182)	(0.182)
2 Weeks After Clothing/Shoe STH			0.0583	0.0629	0.0628	0.0613	0.0539	0.0542	0.0540
			(0.138)	(0.143)	(0.144)	(0.145)	(0.141)	(0.141)	(0.141)
3 Weeks After Clothing/Shoe STH				0.0909	0.0907	0.0903	0.0880	0.0894	0.0872
				(0.168)	(0.169)	(0.170)	(0.169)	(0.170)	(0.169)
4 Weeks After Clothing/Shoe STH					-0.00447	-0.00568	-0.00660	-0.00613	-0.0172
					(0.133)	(0.133)	(0.133)	(0.133)	(0.133)
5 Weeks After Clothing/Shoe STH						-0.132	-0.133	-0.133	-0.138
						(0.149)	(0.149)	(0.149)	(0.148)
6 Weeks After Clothing/Shoe STH							-0.170	-0.170	-0.171
							(0.247)	(0.247)	(0.248)
7 Weeks After Clothing/Shoe STH								0.0342	0.0333
								(0.0985)	(0.0989)
8 Weeks After Clothing/Shoe STH									-0.286**
									(0.129)
Sum of STH Effects	5.506	7.702	9.766	13.20	12.75	12.82	11.01	11.94	9.966
P-Value	0.000	0.000286	0.000504	0.00801	0.0377	0.0659	0.136	0.160	0.300
Observations	5,443,206	5,443,206	5,443,206	5,443,206	5,443,206	5,443,206	5,443,206	5,443,206	5,443,206
Robust standard errors in parentheses									
*** p<0.01, ** p<0.05, * p<0.1									

Notes: Table 19 covers the time period from May - September 2003. We estimate a simple GLS regression for apparel spending. We include a sales tax indicator and separate indicators for the periods up to eight weeks before and after the STH and calendar date fixed effects. Included covariates are age, age squared, income, income squared, fico scores, and a co-applicant dummy. Standard errors are clustered by state. The main independent variables of interest are the sales tax holiday indicator and the indicators for the weeks before and after the sales tax holiday

Table 20: Apparel Spending Two Weeks Before and After Holiday, Alternate Control Groups

		Clothing/Shoe Holiday		
	(1)	(2)	(3)	(4)
	Date Fixed Effects	Region-Date Fixed Effects	Temperature-Date Fixed Effects	School Start-Date Fixed
VARIABLES	Apparel	Apparel	Apparel	Apparel
2 Weeks Before STH	0.226	0.217	0.156	0.522**
	(0.154)	(0.222)	(0.218)	(0.203)
Week Before STH	0.0874	-0.0875	0.0395	0.0118
	(0.120)	(0.107)	(0.0602)	(0.101)
STH	0.912***	0.514***	0.715***	0.812***
	(0.0990)	(0.114)	(0.0815)	(0.188)
Week After STH	0.246	0.178	0.224	0.178
	(0.173)	(0.164)	(0.150)	(0.242)
2 Weeks After STH	0.0621	0.0405	0.0373	-0.233*
	(0.144)	(0.0754)	(0.0826)	(0.118)
Average Day Before and After	0.155	0.0871	0.114	0.120
P-Value	0.0719	0.0533	0.00256	0.181
Sum of STH Effects	9.817	5.519	7.482	8.222
P-Value	0.000443	0.338	0.165	0.00411
Observations	5,443,579	5,443,578	5,416,083	3,825,072
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Table 21: School Supply Spending Two Weeks Before and After Holiday, Alternate Control Groups

	School Supply Holiday			
	(1)	(2)	(3)	(4)
	Date Fixed	Region-Date Fixed Effects	Temperature-Date Fixed	School Start-Date Fixed
VARIABLES	Books and Supplies	Books and Supplies	Books and Supplies	Books and Supplies
2 Weeks Before STH	0.0221	-0.0332	-0.00122	-0.0213
	(0.0245)	(0.0318)	(0.0232)	(0.0287)
Week Before STH	0.0657***	0.0462	0.0548*	0.0668**
	(0.0203)	(0.0343)	(0.0318)	(0.0319)
STH	0.197***	0.196***	0.193***	0.186***
	(0.0361)	(0.0495)	(0.0375)	(0.0408)
Week After STH	0.0491	0.0402	0.0502	-0.00173
	(0.0647)	(0.0800)	(0.0713)	(0.0625)
2 Weeks After STH	0.0658*	0.0853*	0.0841	0.0292
	(0.0391)	(0.0505)	(0.0520)	(0.0586)
Average Day Before and After	0.0507	0.0346	0.0469	0.0183
P-Value	0.0291	0.109	0.138	0.153
Sum of STH Effects	2.098	1.644	1.980	1.151
P-Value	0.00301	0.296	0.0350	0.529
Observations	5,443,579	5,443,578	5,416,083	3,825,072
Robust standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Notes: Tables 20 and 21 cover the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. In both tables, column 1 includes date fixed effects, column 2, region date fixed effects, column 3, temperature date fixed effects, and column 4 school start date-date fixed effects. All regressions have a sales tax holiday indicator, and separate indicators for the periods two weeks before and after the STH, age, age squared, income, income squared, fico scores, and co-applicant flag. The main independent variables of interest are the sales tax holiday indicator and the indicators for the weeks before and after the sales tax holiday.

Table 22: Simulated Sales Tax Holidays

	Clothing/Shoe Holiday									School Supply Holiday
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)
STH	Clothing	Clothing - Men	Clothing-Women	Clothing-Children	Shoes	Shoes-Men	Shoes-Women	Shoes-Children		School Supplies
Actual STH	1.17**	0.24	-0.01	0.98***	1.05***	0.28	0.15	0.62***		-0.1
	(0.57)	(0.23)	(0.30)	(0.34)	(0.40)	(0.27)	(0.15)	(0.22)		(0.26)
Observations	784993	784993	784993	784993	784993	784993	784993	784993		784993
Recent-STH	1.84	-0.45	2.88	-0.68***	0.09	-0.26**	0.42	-0.07		0.50
	(2.37)	(0.42)	(2.34)	(0.25)	(0.56)	(0.13)	(0.50)	(0.19)		(0.50)
Observations	130532	130532	130532	130532	130532	130532	130532	130532		130532

All regressions include controls for age, sex, and race of household head, household size, household composition category, income category and state of residence and are estimated with calendar date fixed effects.

Table 23: Nearby Zip Codes, With Account Fixed Effects, Credit Card Sample

	Clothing/Shoe Holiday							School Supply Holiday
	(1)	(2)	(3)	(4)	(5)	(6)		(7)
VARIABLES	Total Spending	Apparel	Clothing	Kids Clothing	Shoes	Big Box		Books and Supplies
Tax Holiday	1.246***	0.684***	0.398***	0.0909***	0.0898***	0.230***		0.356**
	(0.218)	(0.0966)	(0.0781)	(0.0166)	(0.0287)	(0.0542)		(0.144)
Tax Holiday <17 Miles	1.784**	0.453**	0.405***	0.0448	0.0727	-0.120		-0.0109
	(0.850)	(0.184)	(0.128)	(0.0284)	(0.0488)	(0.105)		(0.0393)
Observations	7,076,457	7,076,457	7,076,457	7,076,457	7,076,457	7,076,457		7,076,457
Robust standard errors in parenthes								
*** p<0.01, ** p<0.05, * p<0.1								

Notes: Table 23 covers the time period from May - September 2003. We estimate a simple GLS regression for overall spending and various components of spending. We include a sales tax holiday indicator, an indicator for an out of state STH in a zipcode less than 17 miles away, calendar date fixed effects and account fixed effects. Standard errors are clustered by state. The main independent variables of interest are the sales tax holiday indicator and the indicators for the living within 17 miles of a sales tax holiday.