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Disentangling Financial Constraints, Precautionary Savings, and Myopia: Household Behavior Surrounding Federal Tax Returns

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ABSTRACT

We explore household consumption surrounding federal tax returns filings and refunds receipt to test various theories of consumption. Because uncertainty regarding the refund is resolved at filing, precautionary savings theory predicts an increase in consumption at this date. Contrary to this prediction, we find that households generally do not increase consumption at filing. Following the receipt of the refunds, consumption of both durables and nondurables increases dramatically and then decays quickly. Our results show that households, on average, are financially constrained, exhibit myopic behavior, and do not respond to precautionary savings motives.

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1. Introduction

Over the last three decades, several theories of household consumption have been proposed to explain the high sensitivity of consumption to cash flows found in many empirical studies. Specifically, the modal finding is that households increase their consumption following the receipt of anticipated and unanticipated cash flows. This result contradicts the standard framework of the Life-Cycle/Permanent Income Hypothesis (LCPIH) (Modigliani and Brumberg 1954, Friedman 1954, Modigliani 1971, Hall 1978), which posits that households should exhibit no reaction to anticipated cash flows and smooth the consumption reaction of unanticipated cash flows over the lifetime. The proposed theories introduce frictions of different kinds (Jappelli and Pistaferri 2010): financial constraints that prevent households from borrowing against future income to smooth consumption (Hayashi 1985, Zeldes 1989, Jappelli, Pischke, and Souleles 1998), income uncertainty which induces precautionary savings ("buffer stock") and subsequent high marginal propensities to consume (Carroll 1997), and myopia (Keynes 1936, Flavin 1984, Campbell and Mankiw 1990, Laibson 1997). Although these theories rely on entirely different sets of assumptions and frictions, their empirical predictions regarding the high sensitivity of consumption to cash are similar and therefore are difficult to disentangle. To determine which theory best describes the data, a new empirical setting must be explored which is different from the status quo of measuring a consumption response to the receipt of anticipated or unanticipated cash flows.

This study provides a novel empirical design that allows us to examine three contrasting explanations for the high sensitivity of household consumption to cash flows: financial constraints, precautionary savings, and myopia. Our data allow us to cleanly identify the date when information about future tax refunds is conveyed to households and the date when the actual tax refund is received. The information received by the household when it files for taxes reduces its future income uncertainty, but the household's income does not change until it receives the refund at a later date. The theories of financial constraints, precautionary savings, and myopia have different predictions about how households will behave around these dates, and our study design allows us to empirically test and compare the three theories.

Our initial dataset includes detailed bank account and credit card information for approximately 500,000 households. It includes transaction-level income and consumption data.

Using this large dataset, we identify a subset of households that use tax filing servicers such as TurboTax. We call the filing date the *information date*. For this subset of households, we also identify the date they received their tax refund from the federal government. We call the refund receipt date the *cash flow date*. After applying various filters, we have complete tax return filing and tax refund receipt information for 27,591 households.

We begin by analyzing the consumption response of households surrounding both the tax filing and tax receipt events.[1] At the tax filing date, households learn how large their refund will be. Since tax refunds are both relatively large (e.g., median refund is 4.4% of annual income) and relatively uncertain, this provides a novel test for the precautionary savings theory. Figure 1 shows that households facing various sources of income uncertainty will hold buffer stock to provide a cushion for bad times, such as during periods of unemployment, when marginal utility is high. Since tax refunds constitute a large source of income uncertainty (and even potentially a negative income, unlike paychecks), precautionary savings theory predicts an increase in consumption at the filing date, on average, due to the reduction in income uncertainty.

Our empirical analysis, however, shows that there is little consumption response to the reduction of uncertainty at the filing date. Consumers do not use existing cash for consumption following the filing date, as the theory predicts. Instead, we observe an increase in purchases via credit cards, providing evidence that households in our data set appear to be financially constrained.

Next, we examine the consumption response of households to the actual cash refund. This event allows us to separate the LCPIH with financial constraints from myopia. According to the latter, households should adjust their consumption upwards in a permanent fashion.[2] Conversely, myopic behavior should express itself in a short burst of consumption since myopic households do not plan well for the future. We find a strong immediate consumption response for both durables (retail purchases and total credit card purchases) and nondurables (restaurants and Automatic Teller Machines (ATMs)), which decays rapidly over the following weeks. The data, therefore, is consistent with myopic behavior as opposed to LCPIH with financial constraints.

[1] Several previous studies documented high sensitivity of consumption to government payments: e.g., Souleles (1999), Johnson, Parker, and Souleles (2006), Agarwal, Liu, and Souleles (2007), Agarwal and Qian (2013).

[2] Lumpy consumption (non-persistent consumption) of durables is within the realm of rationality, but lumpy consumption of nondurables is generally not.

Overall, the household consumption patterns surrounding tax filings and tax refund that we observe reject the buffer-stock theory and provide support to myopic behavior of households that are financially constrained.

2 Hypotheses Development

2.1 General Framework

The framework in this paper is a setting in which households form expectations of future cash flows based on previous cash flows. They are fully informed about the forthcoming cash flow—their tax refund—and they later on receive it. We explore the consumption reaction around two dates: The filing date is our information date, and the tax refund receipt is our cash flow date.

The base case model for the consumption reaction of households to new information and the receipt of cash flows is based on the Euler equation test of the Life-Cycle/Permanent Income Hypothesis formulated by Hall (1978). In this section, we rely on the description provided by Jappelli and Pistaferri (2010). According to the theory, households optimize their consumption given the information known about future cash flows. Households smooth consumption so that the marginal utility from consumption in the current period equals the marginal utility in the next period, assuming the interest rate is equal to the intertemporal discount rate. We notate this using the following Euler equation:

$$u'(c_{it-1}) = E_{t-1}[u'(c_{it})]$$

The main prediction of the LCPIH theory is that households adjust their consumption following income changes. The adjustment of consumption is permanent, as households consume their expected permanent income each period. Permanent and one-time changes in income alike will therefore be smoothed over the lifetime of households, but the effect of transitory changes in income should be negligible.

Empirical studies examining household behavior surrounding anticipated increases in income have largely failed to support the predictions of the LCPIH model. (e.g., Bodkin 1959, Parker 1999, Poterba 1988, Souleles 1999, Gertler and Gruber 2002, Stephens 2003, Stephens 2006, Aaronson, Agarwal and French 2012, Agarwal, Bubna and Lipscomb 2013) Several

studies document strong deviations from the theory, showing that household consumption is highly sensitive to cash flows. For example, Zeldes (1989) finds that the aggregate sensitivity of consumption to income increases with household financial constraints. In contradiction to the LCPIH, Shea (1995) finds excess sensitivity to cash flows, which he attributes to loss-aversion rather than liquidity constraints. Souleles (1999) uses tax refunds to test the LCPIH and finds mixed evidence on financial constraints. More recently, Agarwal, Liu, and Souleles (2007) examine credit card data to see how households used the 2001 federal income tax rebates. They find that, consistent with the LCPIH, households initially saved some of the rebate but later spent more, which is inconsistent with the LCPIH. Cole, Thompson, and Tufano (2008) find that financially constrained households spend their tax refunds more quickly than less constrained households. The common result in these studies is that households increase consumption following the receipt of positive cash flows and that the rate of increase is higher among financially constrained households.

There are three common, non-mutually exclusive explanations for the high sensitivity of household consumption to cash flows: financial constraints, precautionary savings, and myopia. The first explanation is that households would like to behave according to the LCPIH, but financial constraints prevent them from doing so. Most empirical studies test this explanation using Zeldes' (1989) sample splitting approach, where the sample is split into constrained and unconstrained subsamples. The financial constraints explanation is supported if the LCPIH holds for the unconstrained but not for the constrained subsample. Zeldes (1989), and many following papers such as Agarwal, Liu, and Souleles (2007), and Agarwal and Qian (2013) find that financially constrained households have a stronger consumption reaction to cash flows.

The second explanation is that households are impatient and therefore would like to consume now rather than waiting for the future. At the same time, they face uncertainty about their future income and thus engage in precautionary savings ("buffer stock model"; Carroll 1992, 1997). As with financial constraints, consumption is predicted to increase when income increases. The theory is difficult to separate from the financial constraints hypothesis (Jappelli and Pistaferri 2010) because both theories predict similar consumption patterns given realized cash flows. Blundell, Low, and Preston (2013) posit that consumption growth should increase with future consumption uncertainty. Jappelli and Pistaferri (2000) test this prediction using Italian survey data and find support for it.

The third explanation is that households, regardless of whether they are unconstrained, are myopic and do not behave as the LCPIH prescribes. In other words, households are current income spenders: whenever a cash flow arrives, it is consumed. This hypothesis, first proposed by Keynes in 1936, has been further developed by Flavin (1984), Campbell and Mankiw (1990), and Laibson (1997). Several studies have indirectly tested this prediction using household-level data. For example, Shea (1995) finds that households show a higher sensitivity to income declines than increases, which seems to support loss-aversion over financial constraints. Zhang (2013) finds that households that are compensated on a biweekly schedule spend their occasional third monthly paycheck on durable goods. She concludes that households use heuristics for planning consumption.

2.2 Using Information and Cash Flow Dates to Separate the Theories

We argue that one way to disentangle the theories of high cash flow sensitivity is to observe the consumption reactions around information and cash flow dates. When households file their taxes, they become fully informed about whether they will receive a refund and the amount of the refund (or the amount they owe). This allows us to identify changes in uncertainty and to pinpoint households that anticipate a positive change in income.

2.2.1 The Information Event

Under all scenarios presented in Section 2.2, households are informed at the filing date with certainty about the cash flow that they will receive in several weeks. If households are financially constrained or myopic, they cannot react to this information because they do not have access to the cash. Households that have access to short-term credit facilities, such as credit cards, are predicted to use them to finance consumption until the cash arrives.

More importantly, the information households receive on the filing date provides interesting variation in the uncertainty of future income that we use to test the precautionary savings theory. Compared to paychecks, tax refunds represent a relatively uncertain source of future income, due both to the complexity and the time variation of the U.S. tax code. The information date resolves uncertainty for the current year's tax refund and, thus, reduces the

optimal level of precautionary savings. The median tax refund is 4.4% of a household's annual income, representing a significant reduction of uncertainty for the household. Precautionary savings theory predicts that households will consume upon resolving uncertainty—or in our case, when they file their taxes. This prediction is a direct application of the theory and is independent of the households' expectations. As long as there is some uncertainty about the amount of the household's tax refund, resolving it (i.e., filing) should result in a positive average consumption response following the *information date*.

We thus have three hypotheses surrounding household behavior at the time of filing:

H1a: Financial Constraints. Households are financially constrained and therefore cannot respond to the tax filing information. Those who have access to short-term credit use it to accelerate consumption of the forthcoming cash.

H1b: Myopia. Myopic households do not react to the tax filing information. Those who have access to short-term credit use it to accelerate consumption of the forthcoming cash.

H1c: Precautionary Savings. Households liquidate a portion of their buffer stock and consume it as a response to the reduction in uncertainty.

2.2.2 The Cash Flow Event

Next, we examine predictions for the consumption effects on the cash flow date. Households that are financially constrained cannot respond when they learn that they will be getting a tax refund (unless their constraints can be temporarily alleviated) and therefore increase consumption when the cash flow is received. This increase in consumption is expected to be smoothed, and thus we expect to observe a persistent increase in consumption following receipt of the cash. Consistent with this prediction, Hsieh (2003) finds that Alaskan households smooth consumption surrounding the receipt of the anticipated annual oil dividend.

Myopic households act differently on the cash flow date. They increase consumption, though only temporarily. Under the current income version of myopic behavior put forth in Campbell and Mankiw (1990) or Flavin (1984), consumers make spending decisions based on current income rather than permanent income. Under behavioral theories such as the hyperbolic discounting hypothesis of Laibson (1997), households consume immediately due to the bias

toward the present. Therefore we expect households to show a sharp jump in consumption after the receipt of cash, but soon thereafter to revert back to their normal level of spending.

Precautionary savings theory also predicts that households will consume a portion of the refunds they receive. As Carroll (1992) points out, consumption will be less depressed by precautionary savings when wealth increases via income receipt. Hence, we should observe an increase in consumption following the increase in income. However, the prediction about the persistence of consumption predicted by the precautionary savings theory is unclear because households have characteristics that push in opposite directions: they are prudent but at the same time impatient.

We have three primary hypotheses in regard to household behavior at the refund receipt:

H2a: Financial Constraints. Financially constrained households will increase consumption in a permanent manner.

H2b: Myopia. Myopic households will increase consumption temporarily, because they are either current income spenders or hyperbolic discounters.

H2c: Precautionary Savings. Households motivated by precautionary savings will increase their consumption following the cash receipt.

3. Economic Setting and Identification

3.1 Economic Setting

The U.S. government regularly withholds income taxes from the paychecks of each member of a household. Typically, the government withholdings are more than the income tax obligation of the household, resulting in a tax refund during the following calendar year. Households are required by law to file a federal income tax return by mid-April every year, and they often use online tax preparation companies such as TurboTax to calculate and report the amount of income taxes they owe to the government. Through this filing process, households learn whether they owe additional taxes beyond what was already withheld during the year or whether they will receive refunds. There is often a several-weeks delay between the tax filing

date and receipt of the tax refund.[3] This creates a novel setting in which the amount of the tax refund is known ahead of time but is not received until the government deposits the refund in the household's bank account.

Although tax filings can lead to positive or negative payments, we limit our analysis to positive refunds only. Following Altonji and Siow (1987) and Shea (1995), we expect to see an asymmetric response to negative versus positive cash flows with respect to financial constraints. However, we do not include them in our analysis because households with negative tax payments are likely to be under-withholding their income taxes or have realized significant investment gains and thus are likely to be very different in tax sophistication or wealth. Also, relatively few of the households in our sample had a negative filing (about 5% of the full sample).

3.2 Identification

We perform the analysis using a difference-in-differences methodology in which we measure the consumption effects around the tax filing and tax refund events. As described in Section 3.3, our data consist of household-day observations of spending by consumption category. All households in our final data set file tax returns and receive tax refunds. The identification is achieved from the variation in the filing date and the refund date. The basic empirical specification that we pursue is:

$$Comsumption_{ht} = a + \sum_{k=-2}^{4} b_k * I\left(filing_{week_k}\right) + \sum_{k=-2}^{12} c_k * I\left(refund_{week_k}\right)$$

$$+Calendar\ Day\ Fixed\ Effects + Household\ Fixed\ Effects + \varepsilon_{ht.}$$

The sample that we use is at the household-day level. We use four categories of consumption: restaurants (via credit or debit cards), retail (via credit or debit cards), ATM withdrawals, and total credit card purchases. We select these categories since they can be well identified in our data based on text searches. In addition, restaurants and retail represent different levels of durability (restaurant spending are non-durable goods, and retail is typically durable goods). ATM and credit cards represent different types of method of payments. While the first

[3] In 2012, the IRS indicated that 90% refunds were processed within 21 days of filing: http://www.irs.gov/uac/2012-Tax-Season-Refund-Frequently-Asked-Questions.

two categories are mutually exclusive, total credit card purchases includes also some of the spending on restaurants and retail purchases.

The dependent variable is the daily spending in each consumption category. The independent variables of interest are the filing and refund week dummies. These indicator variables receive a value of 1 if the observation is at week *k* relative to the filing or refund events, and 0 otherwise. In addition, we include calendar day fixed effects and household fixed effects. These fixed effects capture the average consumption on a particular calendar day (to remove seasonal effects) and the average household daily level. Hence, the variation that is captured in the filing week dummies and the refund week dummies represent the average excess consumption relative to the average daily consumption amounts and the average household consumption amounts. We include two-week dummies for the weeks prior to the filing event and four-week dummies following the event. In a similar fashion, we include two-week dummies for the weeks prior to the refund event, and 12-week dummies for the weeks following the refund event. The timing of the events is shown in Figure 2.

Our empirical analysis is robust to varying consumption patterns across weekdays. Because we are able to pinpoint the exact dates of the filing and refund and because consumption has a strong weekly pattern (e.g., weekend and weekday consumption is different), our time intervals of interest are seven days long, measured around the dates of filing or refund. For simplicity, we refer to the seven-day intervals as "weeks," e.g., when discussing the consumption in the seven days (week) following the receipt of the tax refund.

4. Data

4.1 Data Source

We use household-level transaction data obtained from a company that provides online account aggregation services to households located in the United States. Through this service households are able to link accounts (401k, IRA, checking, savings, credit card, etc.) from other institutions and aggregate account balances and transactions into a single location, regardless of how many institutions the household is involved with. Additionally, the company provides services such as budgeting and goal setting.

Our data set includes information about banking (i.e., checking, savings, and debit card) transactions and credit card transactions for more than 500,000 households from January 1, 2011, to December 31, 2012. The data set provides the date, amount, and description and indicates whether the transaction is an inflow or an outflow. Thus, our database contains transaction-level data similar to those typically found on monthly bank or credit card statements. Several of the transactions we observe are ambiguous, such as checks. The transaction description does not tell us whether a particular check is a payment to a grocer, a landlord, a stockbroker, or a grandchild, so we look only at the subset of transactions we can cleanly identify through the descriptions. This limits the scope of the consumption measured in this study to that consumed through debit and credit cards, which constitutes the majority of the transactions we observe. Households have unique identifiers that allow us to track them through time. To ensure that our results are not driven by entry or exit into our sample, we construct a balanced sample by including only households for which we have transactions in both January 2011 and December 2012.

4.2 Identifying Key Events and Variables

A key component of the study is identifying the information (tax return filing) and cash flow (tax refund receipt) events. We find the filing date for households by running a keyword search for the top tax preparation services, such as TurboTax (See Appendix A for full list). We are able to capture filing events only for households that used these preparation services and paid using debit or credit cards. As a result, we do not observe households that elected to deduct the preparation charges directly from the refund itself. The transaction date of the tax preparation software is designated as the filing date of the household. We exclude households that have tax preparation transactions on multiple days (as would be the case for a family filing separately on different days).

To identify the date of the federal tax refund or tax payment, we run a keyword search for direct deposits that includes the words “TAX” and “TREASURY” or “USATAXPAYMENT.” As with the filing, we exclude from our sample any household that receives a refund more than once per year. Finally, we require that the filing date precede the tax refund or tax payment date. We require that the tax preparation date be between 1 and 60 days before the tax refund or tax payment. We require a minimum of one day to give us power to disentangle the information

event from the cash flow event. The payment must be made or the refund must be received within 60 days of the filing to place a reasonable upper bound on the processing time of a normal tax refund. In an attempt to limit our sample to more typical refunds, we require that the filing date occur before May 1 and that the refund date occur before June 20. Furthermore, we require the tax return to be positive (i.e., households received cash on the refund date) and the household to have two or more bank or credit card accounts linked with the data provider. We include only those households for whom we can observe tax refunds for two consecutive years. After applying the above filters, our baseline sample contains 27,591 households, corresponding to 10.1 million household-day observations.

In the analysis, we use two measures of financial constraints based on transactions information: income and financial slack. We measure income based on direct deposit of income. Specifically, we search for the keywords PAYROLL, SALARY, SOCIAL SECURITY, DIR DEP, and DIRECT DEPOSIT (with the additional restrictions detailed in Appendix A). We measure income as the sum of all income receipts in the month of January, so that our measurement of income predates tax filing and refund within the year. Our final sample consists of 18,912 households for which we can identify income.

We measure a households' financial slack using the interest that is paid and received on account balances. We do not observe balances directly, so we must infer them through interest transactions. To avoid a mechanical relationship between interest earned and the size of the refund, we limit our search of interest transactions to the first month of the year. To identify bank interest transactions, we run a keyword search containing the word INT (with additional restrictions detailed in Appendix A). Our sample consists of 26,378 households for which there is at least one interest payment received during the month of January. To identify credit interest transactions, we run a keyword search containing the words INTEREST and CHARGE. This sample contains 5,480 households for which there is at least one credit card interest charge incurred during January. To be included in our financial slack calculations, households need to have either interest received or paid, or both. We approximate net bank balance in the following equation, using annual interest rates of 0.6 and 20 percent for bank interest and credit card interest:

$$net\ bank\ balance = \frac{Jan.\ bank\ interest}{0.006/12} - \frac{Jan.\ credit\ card\ interest}{0.20/12}$$

We focus on four consumption categories: restaurants, retail, ATM withdrawals, and total credit card purchases. We identify the list of retailers from a subset of *Stores Magazine*'s top 100 retailers.[4] To identify restaurant transactions, we begin by querying for transactions from the top 100 restaurants, defined as the top 100 restaurants by 2011 revenue according to *Nation's Restaurant News*.[5] We augment this list by querying generic restaurant names such as BURGER, TACO, PIZZA, GRILL, STEAK, etc. The full query is provided in Appendix A. For ATM withdrawals, we query for ATM (not also containing the word FEE) that is debited from the account to estimate how much cash households are withdrawing from their accounts. To identify total credit card purchases, we look at the aggregate spending on the household's credit card accounts. We require that restaurant, retail, ATM, and daily total credit card purchases be greater than $1. To guard against miscategorization of retail and restaurant transactions, we eliminate retail transactions over $5,000, payments to credit cards issued by retailers, and brokerage and fund transfers with the name of the retailer in the description. We winsorize restaurant, retail, ATM, and credit card purchase transaction amounts at the 99% level for each category.

4.3 Summary Statistics

Summary statistics are provided in Table 1. Our final sample contains 27,591 households, which we divide into income quintiles. The mean monthly household income of the sample is $5,510, and the median is $4,334, corresponding to average and median annual household incomes of $66,120 and $52,008, respectively. These figures are quite close to the U.S. Census Bureau estimates of $67,368 and $52,488, respectively, for 2011.[6]

For many households, tax refunds are a substantial addition to their current income. Figure 3 presents the distribution of the total refund amount relative to household income. Approximately half of the households receive refunds greater than or equal to half a month's salary. A quarter of households receive refunds greater than one month's salary. The mean tax refund in our sample is $3,054. Households spend considerable amounts on restaurants and

[4] http://www.stores.org/2012/Top-100-Retailers
[5] http://nrn.com/us-top-100/top-100-chains-us-sales
[6] http://www.census.gov/hhes/www/cpstables/032012/hhinc/hinc01_000.htm

retail. The average daily restaurant expenditure, conditional on going to a restaurant, is $22.97. The mean probability of going to a restaurant on a given day is 26%. Retail spending, conditional on going to a retailer is $69.80 and the mean probability of going to a retailer in a given day is 25%. Similarly, households on average withdraw $176.54 conditional on going to the ATM and spend $139.02 on credit cards conditional on spending on credit cards. The probability of using an ATM machine on a given day is 5%, and the probability of using credit cards is 40%.

5 The Reaction of Households to Tax Refund

Our main tests focus on measuring the average change in consumption at the household level around two critical dates to differentiate between the alternative consumption theories: (1) filing the tax return and (2) receiving the tax refund. Next, we look at the persistence of the consumption reaction to further test the three theories.

Our first series of tests examine the average response of households to the tax filing and tax refund receipt events (Table 2). The sample contains daily household consumption dollar amounts by type of goods: restaurants, retail, ATM withdrawals, or total credit card purchases. The regression specification is as follows:

$$Y_{i,t} = \alpha_{-2} Week_{i,f(-2)} + \cdots + \alpha_4 Week_{i,f(4)} + \beta_{-2} Week_{i,r(-2)} + \cdots + \beta_{12} Week_{i,r(12)} + \gamma_i + \delta_t + \varepsilon_{i,t}.$$

The dependent variable (Y_{it}) is the consumption dollar amount at the household-day level. The explanatory variables of interest are a series of week dummies measuring the time from the tax return filing and refund receipt. We have six week-dummies for the filing event ($Week_{i,f}$) and 14 week-dummies ($Week_{i,r}$) for the refund event; each event includes two weeks before the event and 4 and 12 weeks, following the event respectively. For brevity, we present the first six dummies. We also include household fixed effects (W_i) and calendar day fixed effects (f_t). The household fixed effects capture the average spending of households during the period studied. The calendar day fixed effects capture common seasonal patterns. Hence, the inclusion of these fixed effects ensures that the week dummies around the filing and refund events indeed capture the change in dollar consumption following the event *within* the household consumption time series and do not reflect seasonal patterns. In Table 2, Panel A, we regress

daily dollar consumption amounts on week fixed effects around the filing and refund dates. The regressions show that households are generally unresponsive to the filing event. Spending in the restaurant, retail, and ATM categories is not statistically significant from zero in the weeks before and after the filing. In contrast, during the week that the refund is received, there are strong increases in spending across the categories of restaurants, retail, and ATMs. The increase in consumption following the tax refund event is statistically and economically significant: an 8% increase in restaurant spending, a 12% increase in retail spending, and a 16% increase in ATM withdrawals. Interestingly, we find the opposite reaction in regard to total credit card purchases. We find that credit card purchases increase by 12% following filing, but the sensitivity following the refund is a statistically insignificant 1% increase. This finding supports the financial constraints explanation of the excess sensitivity to cash flows, which we discuss further in the next section.

The increases in average spending around the filing and refund dates can result from a higher propensity to spend or from higher dollar amounts spent, or both. We investigate these alternative possibilities in Table 2, Panel B. We regress a dummy of whether a purchase in the consumption category took place on the week fixed effects and household fixed effects. The results are similar to the previous results: the likelihood of shopping increases around the time of filing and following the actual refund. Following the filing event, households statistically insignificantly increase the likelihood of spending in the categories of restaurants, retail, and ATMs by 1%, 1%, and 4%, respectively. Following the refund event, households increase the likelihood of spending in the categories of restaurants, retail, and ATMs by 5%, 6%, and 7%, respectively. It appears therefore that around the filing event, the increase in the propensity to shop accounts for the entire increase in spending. However, following the actual refund date, the increase in probability accounts only for a fraction of the increase in dollar spending, i.e., there was also an increase in the dollar amount per transaction. We also find a completely different reaction in total credit card purchases. Households were 11% more likely to use credit cards following filing, but they were 3% *less likely* to use credit cards after the refund.

6 Characterizing the Consumption Response Surrounding the Information and Cash Flow Events

6.1 Information or Cash Flow?

Our first test examines the consumption response surrounding the information and cash flow dates. In Table 2, Panel A, we regress the daily dollar consumption level per category (restaurants, retail, ATM, and total credit card expenditure) on event week dummies, household fixed effects, and date fixed effects.

We document that there is little action on the information date. The results in Columns (1) through (3) indicate no statistically significant adjustment in restaurant, retail, and ATM spending, summed across credit and debit cards surrounding the information date. Column (4) shows that total expenditures made via credit cards increase by 12%. Table 2, Panel B, shows similar regressions, but the dependent variable is binary, i.e., whether shopping in the category took place or not. The result shows that the increase in the likelihood of consumption following the information date is weak, except through credit cards.

The consumption reaction surrounding the cash flow date is very strong in all product categories, both in dollar terms and in likelihood. Households increase consumption in restaurant, retail, and ATM categories by 8%, 12%, and 16%, respectively, but total credit card expenditures are not different from zero. Based on these results, it seems that households wait for the arrival of the cash flow before consuming it unless they can borrow short term through credit cards to finance consumption. There is no evidence of increased consumption using cash at hand following the information date.

Our results show that households increase consumption following the return filing date and following the refund receipt date, but the response to the latter date is significantly stronger. Although taxpayers have virtually no uncertainty about the refund amount between the filing and receipt dates, most households do not fully respond following the information date but rather wait until the actual receipt of the cash flow. This phenomenon calls for further investigation.

One explanation for our consumption findings could be that the filing date does not contain *new* information because households could have calculated their projected tax refunds months earlier. While this is technically feasible, it appears that households do react to the

information delivered in the filing date when they have access to credit cards. In particular, households with credit cards use them to increase consumption, demonstrating that information is delivered in the tax filing event. An alternative objection to our conclusion is that households that practice precautionary savings are financially constrained at the same time and thus not able to consume when uncertainty is reduced. However, precautionary savings households hold precautionary savings and thus should be unconstrained, particularly over a two-week time horizon. Our results contradict the prediction of the precautionary savings theory that resolution of uncertainty should result in a positive consumption response, but they are consistent with both the financial constraints and myopia theories.

6.2 Exploring the Financial Constraints of Households

To further investigate the role of financial constraints, we split the sample by household income and financial slack. Households with financial constraints do not react strongly to the information about future cash flows: Because they are constrained, they cannot spend cash based on future promises. Households that are not constrained, however, can use the information about future refunds and are more likely to consume the income when the information is released.

Previous studies have used several proxies for household financial constraints. Since Zeldes (1989) used the ratio of wealth to income to split the sample into constrained and unconstrained subsamples, the literature has followed with splits primarily based on wealth. For example, Runkle (1991) looks at home ownership and liquid savings; Shea (1995) looks at whether wealth is zero or positive; and Souleles (1999) looks at the ratio of wealth to earnings. Recently, Agarwal, Liu, and Souleles (2007) and Agarwal and Qian (2013) examined credit card limits and utilization.

Due to the nature of our data, we are not able to accurately observe the complete picture of a household's access to financial markets, as in Agarwal, Liu and Souleles (2007). Instead, we use a household's bank account transactions to estimate whether it is financially constrained. Because we can observe the paycheck, bank interest, and credit card interest, we split our sample based on both the household's income and financial slack, which is the net bank balance (see Section 4.2). We believe that this is a reasonable approximation of financial constraints since

Jappelli (1990) reports that current income and wealth are closely related to the probability of being financially constrained.

6.2.1 Response to Refund by Income

We begin by splitting the sample by household income. To be included in the sample, households need to receive a clearly identifiable paycheck. Thus, we drop households that are self-employed, unemployed, or otherwise receive paychecks that we cannot identify. Then, we split the population into five groups based on income, and rerun the main tests. For brevity, we present only results for the bottom and top quintiles in the tables; in the accompanying figures, we present the coefficients for all quintile groups.

Table 3, Panel A, shows our results. We find that households in the top-income quintile have much lower excess sensitivities compared to those in the bottom-income quintile. Following the filing event, households show little consumption response in the restaurant, retail, and ATM categories. An exception is an increase in retail shopping by the top-income quintile and a large increase in credit card purchases by both the bottom and top-income quintiles (about an 11% increase for each). Following the receipt of the tax refund, we observe a strong consumption reaction for the bottom-income quintile for restaurants, retail, and ATMs. For example, during the first week following the refund, top-income households increased consumption via restaurants and retail by 3.8% and 3.5%, respectively, and bottom-income households increased consumption by 14% and 21%.

We chart the quintile coefficients as a percentage change from the respective unconditional means for the week following filing and refund in Figure 4. The coefficients are generated by five separate regressions run on subsamples broken down by income. For each subsample, we regress daily consumption on week fixed effects surrounding the filing event and the refund event. We scale the coefficients by the average daily consumption in the category; hence, the magnitudes present the percentage change in consumption. The regressions show that the consumption response in the week following the filing is mostly flat and close to zero for all income quintiles. However, the consumption response in the week after the refund is significantly different from zero and is lower among high-income households.

In regard to financial constraints, the analysis of total credit purchases has an important interpretation. Since households with credit cards have some access to credit markets, credit card spending can be an estimate of consumption under relaxed constraints. The results for total credit card spending stand in stark contrast to the consumption behavior for restaurants, retail, and ATMs. Table 3, Panel A, shows a strong significant response in the week after the filing date and weaker sensitivity in the week following the refund date. In Figure 4, we can see that while abnormal expenditures for restaurants, retail, and ATMs are greater in the week of the refund, it is the opposite for total credit card expenditures. Also, there seems to be no difference in the response among the income quintiles when we condition for credit card expenditures in contrast to the higher sensitivity seen among low-income households in restaurant, retail, and ATM consumption. This result still supports the financial constraints theory since low-income households with credit cards are not financially constrained.

The result about the credit card consumption leads to two important conclusions. First, because households act on the information conveyed in the filing event, we conclude that the filing date is informative for households—it is not information that they ignore. Second, the only observable consumption response following the filing date is the use of a short-term credit facility (credit cards), providing evidence that households are indeed financially constrained.

6.2.2 Response to Refund by Financial Slack

Another way to stratify the population by financial constraints is by using a proxy for financial slack. Unfortunately, we do not observe the balances on households' accounts. Yet, we can proxy the financial slack related to their liquid resources using the following method. The dataset includes the interest paid to credit card companies and interest received from banks. We assume that the interest rate paid is 20% and that the interest rate received is 0.6%. Given the interest paid and received and the assumptions about the interest rates, we can calculate a ballpark figure for a household's balances at credit card companies and banks. For each household, we estimate the total balances and then split the population into five "financial slack" groups.

We rerun the main specifications for the five subsamples and present the results for the extreme quintiles in Table 3, Panel B. Our results show that the different financial slack groups

consume roughly the same dollar amounts on average across the restaurant, retail, and ATM categories. For example the low financial slack households spend $15.83 per day on average within the retail category, and the high financial slack households spend $18.77 per day on average within the same category.

Although the difference in average spending across the financial slack groups is small, we observe a large difference in the excess sensitivity following the refund event. After receiving tax refunds, the high-slack households increase restaurant and retail consumption by 7% and 9%, respectively. However, low-slack households show a much more dramatic increase in spending of 14% and 25% on restaurants and retail, respectively. As with the income quintiles, there is no significant consumption response following the week after filing within the restaurant, retail, and ATM withdrawal categories.

In Figure 5, we chart the quintile coefficients as a percentage change from the respective unconditional means. The results are largely similar to those of Figure 4, with high sensitivity decreasing with higher slack. We also look at credit card expenditures and find similar results as before. Excess credit card spending is concentrated in the week following the filing date and is weaker in the weeks following the actual refund.

Overall, the results of this analysis show that households react primarily to actual cash flows. The only exception being that credit cards (which are a form of short-term debt) are used primarily following the filing date. We see this exception as evidence of financial constraints, because households at all financial constraints levels do not use disposable cash to react to cash flow news.

6.3 Response Persistence

The previous results provided supportive evidence for either the LCPIH or myopia theories. We next examine the shape of the response of households over time to disentangle financial constraints from myopia. The financial constraint theory holds that financially constrained households are still rational and therefore will strive to smooth consumption over time. The predicted pattern of the consumption reaction is a step function once the cash is received and the constraint is alleviated. Conversely, myopia argues that households increase

consumption temporarily—consuming the cash that was received—with little effect on long-run consumption.[7]

The regressions in Panel A of Table 2 allow us to examine the time-series pattern. We tabulate the previously omitted variables in Table 4 for completeness. We observe that following the cash flow date, all consumption categories exhibit a sharp increase followed within two to three weeks by a quick decline back to the previous average level of consumption. We also present these coefficients in Figure 6. The lack of a persistent response to the income change is another piece of evidence against the LCPIH and alternative theories based on rational expectations: if the spike in consumption were due to some sort of financial constraint, we would expect households to smooth consumption after the change in income has been realized.

These findings support the myopia hypothesis that households consume cash flows that come their way without much planning or smoothing. If households are present-biased (Laibson, 1997), they would also show a lack of persistence in consumption even with future planning, because they prefer to spend in the present.

7 Conclusion

Empirical studies have consistently shown that household consumption is highly sensitive to cash flows, and researchers have developed several theories to explain this pattern. The theories differ in their assumptions about the rationality of households and the constraints they face. Despite stark differences among such theories, empirical tests had trouble distinguishing among them with the available data.

We exploit a novel setting surrounding the annual filing of U.S. tax returns and tax refund receipts to provide a direct test of three common theories of household consumption behavior: precautionary savings, financial constraints, and myopia. We measure this consumption response at both the information receipt date and the cash flow receipt date. The tax refund filing allows us to directly observe the effects of variation in the uncertainty of future

[7] The prediction of the precautionary savings theory about the persistence of the consumption response is less clear. On one hand, households are impatient and may be inclined to consume cash quickly, but on the other – they are prudent, hence may desire to smooth their consumption.

income on a household's consumption behavior. This setting, combined with the household demographics that we observe, allow us to explore in-depth the causes of excess sensitivity.

Our findings confirm the existence of both financial constraints and myopia in households. Households wait to consume until cash is received rather than at the information acquisition date, which is consistent with the presence of financial constraints. Further, this effect is decreasing in the amount of financial constraints in the household, using proxies of either income or net banking balance. Additionally, excess credit card spending occurs at filing but not at the refund date, consistent with unconstrained households responding to positive cash flow information rather than receipt of the funds.

We do not find evidence supporting the precautionary savings theory. The theory predicts that the resolution of cash flow uncertainty will lead to a consumption response. Yet, we document no such response surrounding the information date, when uncertainty is resolved.

We do, however, find evidence of household myopia. We first document that households' consumption patterns quickly decay following the cash flow date. This pattern is consistent with myopic behavior rather than consumption smoothing over time. Our results are consistent with households being, on average, both financially constrained and myopic.

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Appendix A. Method of Categorizing Transactions

Income

- Inflow, and
- Transaction in bank account
- Transaction amount is greater than $500, and
- Contains one of the following keywords:
    - “payroll”
    - “salary”
    - “social security”
    - “dir dep” and NOT “ach”
    - “direct dop” and NOT “ach”
- Does not contain one of the following keywords:
    - “fia csna”

Restaurant

- Outflow, and
- Amount NOT over $5,000, and
- Contains one of the following keywords:
    - “mcdonald's”
    - “mcdonalds”
    - “subway”
    - “starbucks”
    - “burger”
    - “wendys”
    - “wendy's”
    - “taco”
    - “donut”
    - “pizza”
    - “kfc”
    - “applebees”
    - “grill”
    - “bar”
    - “chicke”
    - “chick fil”
    - “chick-fil”
    - “sonic d”
    - “olive g”
    - “chili's”
    - “chilis”
    - “grill”
    - “panera”
    - “box”
    - “arbys”
    - “dairy queen”
    - “lobster”
    - “ihop”
    - “denny's”
    - “dennys”
    - “outback”
    - “steak”
    - “chipotle”
    - “buffalo wild”
    - “cracker barrel”
    - “hardees”
    - “fri”
    - “popeyes”
    - “golden corral”
    - “cheesecake”
    - “panda ex”
    - “little caesars”
    - “carls j”
    - “carl's j”
    - “ruby tuesday”
    - “roadhouse”
    - “whataburger”
    - “red robin”
    - “jimmy john”
    - “waffle”
    - “restau”
    - “bob evans”
    - “five guys”
    - “pf chang”
    - “casino”
    - “quiznos”
    - “zaxby”
    - “culver's”

    - “culvers”
    - “long john”
    - “papa murphy”
    - “perkins res”
    - “carrabba”
    - “macaroni”
    - “cream”
    - “pollo”
    - “deli”
    - “o'charley”
    - “boston mark”
    - “krispy k”
    - “qdoba”
    - “white ca”
    - “cici”
    - “famous dav”
    - “tim horton”
    - “bonefish”
    - “jamba”
    - “juice”
    - “cheddar's”
    - “cheddars”
    - “bagle”
    - “seafood”
    - “checkers”
    - “eatery”
    - “sbarro”
    - “cheese”
    - “bakery”
    - “cantina”
    - “yogurt”
    - “smoothie”
    - “salad”
    - “.com”
    - “cuisine”
    - “grill”
    - “grille”
    - “fish”
    - “sushi”
    - “sandwich”
    - “cocktail”
    - “cafe”
    - “tavern”
    - “coffee”
    - “seafood”
    - “lobster”
    - “crab”
    - “dining”
    - “buffet”
    - “bbq”
    - “b.b.q”
    - “barbecue”
- Does NOT contain one of the following keywords:
    - “pmt”
    - “payment”
    - “pymt”
    - “pmts”
    - “payments”
    - “pymts”
    - “bill pay”
    - “paymnt”
    - “paymnts”
    - “checkpaymt”
    - “checkpaymt”
    - “brokerage”
    - “:bill pay”
    - “co id:”
    - “co id”
    - “outgoing”
    - “transfer”
    - “wire”
    - “amazon” and “web”
    - “aws.amazon”
    - “amazon” and “p.o.s.”
    - “funds”
    - “banks”
    - “amazon” and “services”

Retail

- Outflow, and
- Amount NOT over $5,000, and
- Contains one of the following keywords:
    - “wal-mart”
    - “walmart”

- “wal mart”
- “target”
- “walgreen”
- “costco”
- “depot”
- “cvs”
- “lowe's”
- “lowes”
- “best” and “buy”
- “sears”
- “amazon”
- “macy's”
- “rite aid”
- “kohls”
- “apple”
- “maxx”
- “marshalls”
- “homegoods”
- “penney”
- “true v”
- “meijer”
- “dollar g”
- “wholesale” and “bj”
- “gap”
- “nordstrom”
- “eleven”
- “staples”
- “ace h”
- “bed” and “bath”
- “ross” and “store”
- “victoria” and “secret”
- “henri” and “bendel”
- “white” and “barn”
- “la” and “senza”
- “family” and “dol”
- “toys” and “us”
- “babies” and “us”
- “menards”
- “office d”
- “barnes” and “nob”
- “health” and “mar”
- “game” and “stop”
- “dollar” and “tree”
- “auto” and “zone”
- “dillard”
- “advance auto”
- “oreilly a”
- “o'reilly a”
- “office” and “max”
- “qvc”
- “dick's s”
- “dicks s”
- “petsm”
- “big” and “lots”
- “jcpenney”
- “couche” and “tard”
- “circle k”
- “on the run”
- “dell sales & service”
- “dell.com”
- “dell preferred”
- “sherwin-williams”
- “sherwin williams”
- “tractor” and “sup”
- “foot” and “locker”
- “radio” and “shack”
- “burlington co”
- “michaels”
- “belk”
- “williams” and “sonoma”
- “ikea”
- “sports” and “auth”

- Does NOT contain one of the following keywords:
  - “pmt”
  - “payment”
  - “pymt”
  - “pmts”
  - “payments”
  - “pymts”
  - “bill pay”
  - “paymnt”
  - “paymnts”
  - “checkpaymt”
  - “checkpaymt”
  - “brokerage”
  - “:bill pay”
  - “co id:”
  - “co id”
  - “outgoing”
  - “transfer”
  - “wire”

- “amazon” and “web”
- “aws.amazon”
- “amazon” and “p.o.s.”
- “funds”
- “banks”
- “amazon” and “services”

Tax filing

- Outflow, and
- Contains keyword “tax” and
- Contains one of “turbo”, “hrb”, “taxact”, “slayer”, “brain” and “complete”

Tax refund

- Inflow, and
- Contains keywords “treasury” and “tax”

Tax payment

- Outflow, and
- Contains keywords (“usataxpymt”) or (“treasury” and “tax”)

Bank Interest

- Inflow, and
- In the month of January, and
- Transaction in bank account, and
- Contains keyword “int”
- Does not contain keywords “depos” or “transfer”

Credit Card Interest

- Outflow, and
- In the month of January, and
- Transaction in credit card account, and
- Contains keywords “interest” and “charge”

Table 1. Summary Statistics

	Obs	Mean	Std Dev	p1	p25	p50	p90	p99
Household Demographics								
Refund Amount	27,591	$3,054	$2,607	$26	$1,058	$2,341	$6,704	$11,586
Refund Change (= Refund Amount - Lag(Refund Amount))	27,591	($112)	$2,164	($6,872)	($1,003)	($30)	$2,317	$5,853
Days Between Filing and Refund	27,591	10.7	8.3	1	6	9	19	48
Monthly Income (Conditional)	18,912	$5,510	$10,296	$200	$2,776	$4,334	$9,314	$23,241
Monthly Bank Interest (Cconditional)	26,378	$167.42	$2,574.60	$0.00	$0.11	$0.51	$21.19	$5,222.22
Monthly Credit Card Interest (Unconditional)	27,591	$13.85	$51.65	$0.00	$0.00	$0.00	$35.28	$253.63
Monthly Credit Card Interest (Conditional on paying interest)	5,480	$69.71	$97.67	$0.84	$12.69	$35.75	$174.35	$471.04
Total Spending (Debit + Credit)								
Unconditional Restaurant Amount	10,098,306	$6.07	$16.45	$0.00	$0.00	$0.00	$19.70	$82.19
Unconditional Retail Amount	10,098,306	$17.13	$56.50	$0.00	$0.00	$0.00	$49.86	$277.08
Unconditional ATM Amount	10,098,306	$8.16	$61.26	$0.00	$0.00	$0.00	$0.00	$203.00
Unconditional Credit Card Purchases Amount	10,098,306	$55.19	$155.54	$0.00	$0.00	$0.00	$151.36	$806.15
Restaurant Amount (Conditional on non-zero values)	2,669,164	$22.97	$25.21	$1.95	$7.51	$14.22	$51.54	$129.26
Retail Amount (Conditional on non-zero values)	2,477,934	$69.80	$96.60	$1.29	$14.25	$37.05	$167.96	$491.14
ATM Amount (Conditional on non-zero values)	466,621	$176.54	$226.90	$20.00	$60.00	$100.00	$400.00	$1,000.00
Credit Card Purchase Amount (Conditional on non-zero	4,008,638	$139.02	$222.00	$1.62	$26.10	$65.98	$319.97	$1,339.19
Restaurant Dummy	10,098,306	0.264						
Retail Dummy	10,098,306	0.245						
ATM Dummy	10,098,306	0.046						
Credit Card Purchase Dummy	10,098,306	0.397						
Debit Spending Only								
Unconditional Restaurant Amount	10,098,306	$3.45	$11.48	$0.00	$0.00	$0.00	$10.54	$58.45
Unconditional Retail Amount	10,098,306	$8.97	$36.66	$0.00	$0.00	$0.00	$17.89	$185.91
Unconditional ATM Amount	10,098,306	$8.15	$61.23	$0.00	$0.00	$0.00	$0.00	$203.00
Unconditional Credit Card Purchases Amount	10,098,306	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Credit Spending Only								
Unconditional Restaurant Amount	10,098,306	$2.62	$12.19	$0.00	$0.00	$0.00	$2.39	$59.53
Unconditional Retail Amount	10,098,306	$8.16	$43.25	$0.00	$0.00	$0.00	$4.99	$188.58
Unconditional ATM Amount	10,098,306	$0.01	$1.66	$0.00	$0.00	$0.00	$0.00	$0.00
Unconditional Credit Card Purchases Amount	10,098,306	$55.19	$155.54	$0.00	$0.00	$0.00	$151.36	$806.15

Table 2. Consumption Reaction to Filing and Refund

This table explores the response of households to the filing of tax returns and the receipt of tax refunds. The data consist of daily household spending data for the categories of restaurants, retail, ATM, and credit card purchases. Household days when there is no spending in a category receive a value of zero. In Panel A, the dependent variable is the dollar amount of spending in the respective category. In Panel B, the dependent variable is a dummy variable indicating whether there was spending in the category. The independent variables include week dummies around the tax filing and tax refund events as well as day and household fixed effects. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Consumption Response to Refund ($)

Dependent variable:	Daily $ spent on …			
	Restaurants	Retail	ATM	Credit Card Purchases
	(1)	(2)	(3)	(4)
Filing: Week -2	0.15***	0.00	-0.05	1.41***
	(3.73)	(0.02)	(-0.35)	(3.79)
Filing: Week -1	0.04	-0.18	-0.20	1.18***
	(0.75)	(-1.18)	(-1.20)	(2.61)
Filing: Week 0	0.07	0.15	-0.04	6.38***
	(1.33)	(0.82)	(-0.22)	(12.27)
Filing: Week 1	0.05	0.02	-0.19	1.33**
	(0.84)	(0.09)	(-0.98)	(2.42)
Filing: Week 2	0.11*	-0.04	-0.34*	0.74
	(1.92)	(-0.21)	(-1.77)	(1.40)
Filing: Week 3	0.03	0.26	0.01	0.51
	(0.68)	(1.56)	(0.05)	(1.09)
Refund: Week -2	0.16***	0.15	-0.09	0.89*
	(3.21)	(0.92)	(-0.57)	(1.93)
Refund: Week -1	0.20***	0.78***	0.13	0.88*
	(3.64)	(4.22)	(0.75)	(1.67)
Refund: Week 0	0.50***	2.09***	1.31***	0.37
	(8.46)	(10.41)	(6.24)	(0.65)
Refund: Week 1	0.48***	1.59***	0.51***	1.30**
	(8.28)	(8.24)	(2.70)	(2.42)
Refund: Week 2	0.25***	1.21***	0.31*	1.82***
	(4.90)	(6.95)	(1.75)	(3.76)
Refund: Week 3	0.29***	0.75***	0.10	0.77*
	(6.37)	(5.17)	(0.71)	(1.84)
Household fixed effects	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes
Week 4-12 dummies after refund	Yes	Yes	Yes	Yes
Obs	10,098,306	10,098,306	10,098,306	10,098,306
Adj. R^2	0.093	0.062	0.077	0.128
Unconditional mean	$6.07	$17.13	$8.16	$55.19
Filing: Week 0 / Unconditional mean	1.2%	0.9%	-0.5%	11.6%
Refund: Week 0 / Unconditional mean	8.2%	12.2%	16.1%	0.7%

Table 2. Consumption Reaction to Filing and Refund (Cont.)

Panel B: Consumption Response to Refund (Probability)

Dependent variable:	Daily indicator of transaction of…			
	Restaurants	Retail	ATM	Credit Card Purchases
	(1)	(2)	(3)	(4)
Filing: Week -2	0.004***	0.001	0.001	0.008***
	(3.168)	(0.922)	(1.477)	(6.806)
Filing: Week -1	0.002	-0.000	-0.000	0.009***
	(1.241)	(-0.303)	(-0.161)	(6.425)
Filing: Week 0	0.003*	0.003**	0.002***	0.045***
	(1.959)	(2.259)	(2.749)	(29.859)
Filing: Week 1	0.001	0.001	0.001	0.012***
	(0.782)	(0.569)	(0.898)	(7.436)
Filing: Week 2	0.002	0.000	0.000	0.007***
	(1.405)	(0.181)	(0.121)	(4.563)
Filing: Week 3	0.002	0.002	0.001	0.003**
	(1.211)	(1.417)	(1.320)	(2.417)
Refund: Week -2	0.004***	0.002*	-0.000	0.003**
	(3.216)	(1.790)	(-0.855)	(2.275)
Refund: Week -1	0.006***	0.006***	-0.000	-0.003*
	(3.916)	(4.130)	(-0.304)	(-1.855)
Refund: Week 0	0.014***	0.014***	0.003***	-0.014***
	(8.624)	(9.705)	(5.259)	(-8.455)
Refund: Week 1	0.012***	0.009***	0.001*	-0.007***
	(7.784)	(6.506)	(1.826)	(-4.275)
Refund: Week 2	0.008***	0.009***	0.000	-0.001
	(5.541)	(7.131)	(0.502)	(-0.938)
Refund: Week 3	0.007***	0.006***	0.001	-0.001
	(5.597)	(5.399)	(1.108)	(-0.782)
Household fixed effects	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes
Week 4 dummy after filing	Yes	Yes	Yes	Yes
Week 4-12 dummies after refund	Yes	Yes	Yes	Yes
Obs	10,098,306	10,098,306	10,098,306	10,098,306
Adj. R^2	0.155	0.109	0.114	0.345
Unconditional mean	0.264	0.245	0.046	0.397
Filing: Week 0 / Unconditional mean	1.1%	1.2%	4.3%	11.3%
Refund: Week 0 / Unconditional mean	5.3%	5.7%	6.5%	-2.5%

Table 3. Consumption Reaction to Tax Refunds, by Financial Constraints

This table explores the role of financial constraints in the response of households to the filing of tax returns and the receipt of tax refunds. Panel A divides the sample into income quintiles. Panel B divides the sample into net bank balance quintiles. In Panel A, income quintiles 1 and 5 denote bottom income and top income, respectively. In Panel B, net bank balance quintiles 1 and 5 denote bottom net bank balance and top net bank balance, respectively. The data consist of daily household spending data for the categories of restaurants, retail, ATM, and credit card purchases. Household days when there is no spending in a category receive a value of zero. The dependent variable is the dollar amount of spending in the respective category. The independent variables include week dummies around the tax filing and tax refund events as well as day and household fixed effects. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: By Income Quintile

Dependent variable:	Daily $ spent on …							
	Restaurants		Retail		ATM		Credit Card Purchases	
Income quintile:	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Filing: Week -2	0.23**	0.22	-0.29	-0.16	0.11	0.24	0.84	2.59**
	(2.36)	(1.62)	(-0.96)	(-0.40)	(0.31)	(0.47)	(0.98)	(1.99)
Filing: Week -1	0.06	0.29*	0.23	0.35	-0.08	-0.65	0.10	2.32
	(0.47)	(1.82)	(0.58)	(0.71)	(-0.17)	(-1.14)	(0.09)	(1.54)
Filing: Week 0	0.07	0.04	-0.18	1.22**	-0.20	-0.84	4.50***	9.44***
	(0.50)	(0.23)	(-0.41)	(2.14)	(-0.39)	(-1.53)	(3.82)	(5.49)
Filing: Week 1	0.09	0.11	0.03	0.35	-1.09**	-0.02	1.60	3.20*
	(0.59)	(0.60)	(0.05)	(0.60)	(-2.16)	(-0.03)	(1.29)	(1.78)
Filing: Week 2	0.05	0.16	0.28	0.69	-0.57	-0.32	0.12	2.97*
	(0.37)	(0.94)	(0.62)	(1.22)	(-1.19)	(-0.50)	(0.10)	(1.69)
Filing: Week 3	-0.07	-0.13	0.20	1.62***	0.40	-0.46	-0.65	3.15*
	(-0.61)	(-0.82)	(0.50)	(3.00)	(0.80)	(-0.78)	(-0.66)	(1.92)
Refund: Week -2	0.16	0.21	-0.38	-0.67	0.11	-0.41	-0.16	-0.84
	(1.28)	(1.22)	(-0.98)	(-1.35)	(0.23)	(-0.77)	(-0.16)	(-0.55)
Refund: Week -1	0.39***	0.10	0.44	-0.03	0.22	0.85	1.40	-1.16
	(2.93)	(0.56)	(1.02)	(-0.05)	(0.42)	(1.45)	(1.20)	(-0.67)
Refund: Week 0	0.74***	0.32*	2.89***	0.83	2.18***	1.49*	0.32	0.05
	(5.19)	(1.72)	(5.92)	(1.36)	(3.84)	(1.91)	(0.26)	(0.03)
Refund: Week 1	0.74***	0.26	1.80***	-0.03	0.75	0.59	1.39	-2.01
	(5.10)	(1.48)	(3.94)	(-0.05)	(1.46)	(0.95)	(1.15)	(-1.16)
Refund: Week 2	0.43***	0.02	1.39***	0.74	-0.17	1.29**	0.67	0.62
	(3.46)	(0.11)	(3.40)	(1.38)	(-0.34)	(2.17)	(0.62)	(0.40)
Refund: Week 3	0.45***	0.14	0.93***	0.33	-0.38	1.39***	0.39	-0.28
	(4.30)	(0.89)	(2.72)	(0.68)	(-1.01)	(2.61)	(0.41)	(-0.19)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week 4 dummy after filing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week 4-12 dummies after refund	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,384,578	1,384,212	1,384,578	1,384,212	1,384,578	1,384,212	1,384,578	1,384,212
Adj. R^2	0.091	0.094	0.062	0.064	0.079	0.081	0.123	0.137
Unconditional mean	5.20	8.37	14.12	23.90	7.69	13.28	38.34	88.70
Filing: Week 0 / Unconditional mean	1.3%	0.5%	-1.3%	5.1%	-2.6%	-6.3%	11.7%	10.6%
Refund: Week 0 / Unconditional mean	14.2%	3.8%	20.5%	3.5%	28.3%	11.2%	0.8%	0.1%

Table 3. Consumption Reaction to Tax Refunds, by Financial Constraints (Cont.)

Panel B: By Financial Slack Quintile

Dependent variable:	Daily $ spent on …							
	Restaurants		Retail		ATM		Credit Card Purchases	
Financial slack quintile:	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Filing: Week -2	0.19**	0.14	-0.37	0.26	0.07	-0.64	-0.02	1.51
	(2.10)	(1.43)	(-1.49)	(0.80)	(0.21)	(-1.63)	(-0.03)	(1.53)
Filing: Week -1	-0.07	-0.09	-0.23	0.35	-0.71**	0.39	1.35	0.62
	(-0.66)	(-0.75)	(-0.72)	(0.90)	(-2.07)	(0.77)	(1.47)	(0.53)
Filing: Week 0	0.04	-0.07	-0.14	0.24	-0.30	-0.56	7.14***	7.34***
	(0.32)	(-0.54)	(-0.37)	(0.54)	(-0.82)	(-1.14)	(6.88)	(5.54)
Filing: Week 1	-0.01	0.05	-0.10	-0.57	-0.52	0.10	1.63	0.28
	(-0.08)	(0.40)	(-0.23)	(-1.20)	(-1.26)	(0.18)	(1.48)	(0.21)
Filing: Week 2	0.02	-0.03	-0.69*	-0.10	-0.54	-0.19	0.11	-0.06
	(0.12)	(-0.24)	(-1.70)	(-0.23)	(-1.35)	(-0.32)	(0.10)	(-0.05)
Filing: Week 3	-0.19	-0.05	-0.56	-0.08	0.29	-0.63	-0.04	-0.90
	(-1.64)	(-0.39)	(-1.48)	(-0.20)	(0.81)	(-1.27)	(-0.04)	(-0.73)
Refund: Week -2	0.26**	0.32***	0.33	-0.56	0.18	-0.33	0.37	2.24*
	(2.38)	(2.68)	(1.00)	(-1.42)	(0.51)	(-0.69)	(0.39)	(1.87)
Refund: Week -1	0.41***	0.28**	0.92**	0.72	0.65*	0.26	-1.34	2.01
	(3.21)	(2.15)	(2.38)	(1.56)	(1.66)	(0.51)	(-1.28)	(1.49)
Refund: Week 0	0.86***	0.46***	3.92***	1.63***	2.26***	1.38**	-0.49	3.07**
	(6.57)	(3.29)	(8.73)	(3.27)	(5.12)	(2.30)	(-0.43)	(2.09)
Refund: Week 1	0.94***	0.52***	2.95***	1.01**	1.01**	0.57	2.35**	1.84
	(7.14)	(3.75)	(6.94)	(2.24)	(2.57)	(1.10)	(2.08)	(1.33)
Refund: Week 2	0.51***	0.17	2.01***	0.73*	0.44	1.04*	0.41	4.37***
	(4.37)	(1.35)	(5.17)	(1.72)	(1.22)	(1.95)	(0.42)	(3.43)
Refund: Week 3	0.45***	0.14	1.51***	-0.27	0.45	0.47	1.23	0.15
	(4.38)	(1.37)	(4.73)	(-0.75)	(1.43)	(1.07)	(1.44)	(0.14)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week 4 dummy after filing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Week 4-12 dummies after refund	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2,026,542	1,930,650	2,026,542	1,930,650	2,026,542	1,930,650	2,026,542	1,930,650
Adj. R^2	0.114	0.091	0.078	0.059	0.078	0.081	0.129	0.129
Unconditional mean	6.11	6.32	15.83	18.77	8.46	11.87	43.77	73.97
Filing: Week 0 / Unconditional mean	0.7%	-1.1%	-0.9%	1.3%	-3.5%	-4.7%	16.3%	9.9%
Refund: Week 0 / Unconditional mean	14.1%	7.3%	24.8%	8.7%	26.7%	11.6%	-0.9%	4.2%

Table 4. Consumption Reaction to Filing and Refund

(Extended Version of Table 2, Panel A)

This table presents the full results of the regressions run in Table 2. The data consist of daily household spending data for the categories of restaurants, retail, ATM, and credit card purchases. Household days when there is no spending in a category receive a value of zero. The dependent variable is the dollar amount of spending in the respective category. The independent variables include week dummies around the tax filing and tax refund events as well as day and household fixed effects. All regressions are OLS regressions. Standard errors are clustered at the household level. *t*-statistics are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Daily $ spent on …			
	Restaurants	Retail	ATM	Credit Card Purchases
	(1)	(2)	(3)	(4)
Filing: Week -2	0.15***	0.00	1.41***	-0.61
	(3.73)	(0.02)	(3.79)	(-0.71)
Filing: Week -1	0.04	-0.18	1.18***	0.99
	(0.75)	(-1.18)	(2.61)	(0.93)
Filing: Week 0	0.07	0.15	6.38***	0.09
	(1.33)	(0.82)	(12.27)	(0.07)
Filing: Week 1	0.05	0.02	1.33**	2.71**
	(0.84)	(0.09)	(2.42)	(2.08)
Filing: Week 2	0.11*	-0.04	0.74	5.50***
	(1.92)	(-0.21)	(1.40)	(4.12)
Filing: Week 3	0.03	0.26	0.51	2.27*
	(0.68)	(1.56)	(1.09)	(1.90)
Refund: Week -2	0.16***	0.15	-0.09	0.89*
	(3.21)	(0.92)	(-0.57)	(1.93)
Refund: Week -1	0.20***	0.78***	0.13	0.88*
	(3.64)	(4.22)	(0.75)	(1.67)
Refund: Week 0	0.50***	2.09***	1.31***	0.37
	(8.46)	(10.41)	(6.24)	(0.65)
Refund: Week 1	0.48***	1.59***	0.51***	1.30**
	(8.28)	(8.24)	(2.70)	(2.42)
Refund: Week 2	0.25***	1.21***	0.31*	1.82***
	(4.90)	(6.95)	(1.75)	(3.76)
Refund: Week 3	0.29***	0.75***	0.10	0.77*
	(6.37)	(5.17)	(0.71)	(1.84)
Refund: Week 4	0.24***	0.85***	0.37**	1.48***
	(5.49)	(5.88)	(2.55)	(3.55)
Refund: Week 5	0.27***	1.09***	0.24	2.22***
	(6.00)	(7.27)	(1.51)	(5.19)
Refund: Week 6	0.17***	0.49***	0.28*	1.77***
	(3.77)	(3.37)	(1.85)	(4.11)
Refund: Week 7	0.21***	0.48***	-0.02	1.58***
	(4.82)	(3.33)	(-0.14)	(3.71)
Refund: Week 8	0.15***	0.39***	0.27*	0.64
	(3.39)	(2.71)	(1.82)	(1.54)
Refund: Week 9	0.18***	0.36**	0.13	1.28***
	(4.18)	(2.51)	(0.86)	(3.08)
Refund: Week 10	0.05	0.30**	-0.08	0.79*
	(1.23)	(2.08)	(-0.53)	(1.93)
Refund: Week 11	0.19***	0.08	0.10	0.62
	(4.45)	(0.56)	(0.74)	(1.57)
Household fixed effects	Yes	Yes	Yes	Yes
Day fixed effects	Yes	Yes	Yes	Yes
Obs	10,098,306	10,098,306	10,098,306	10,098,306
Adj. R^2	0.093	0.062	0.077	0.128
Unconditional mean	$6.07	$17.13	$8.16	$55.19

Figure 1: Components of Buffer Stock

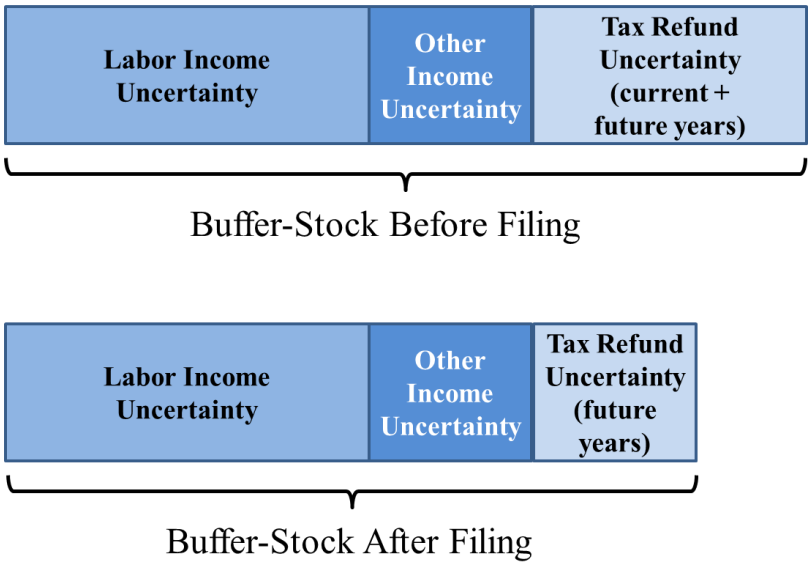


Figure 2: Timing of Events

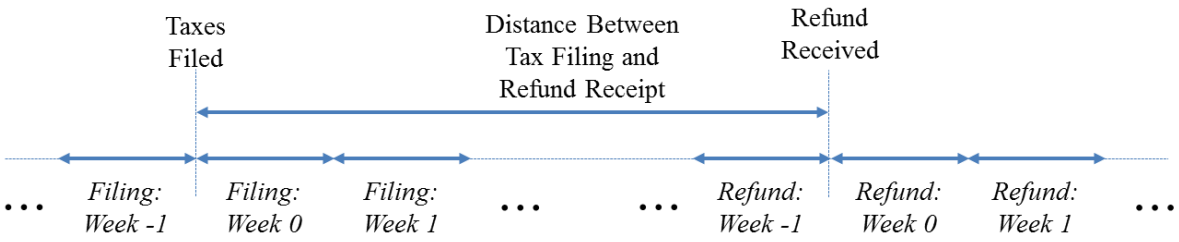


Figure 3: Histogram of Refund Amount Normalized by Monthly Income

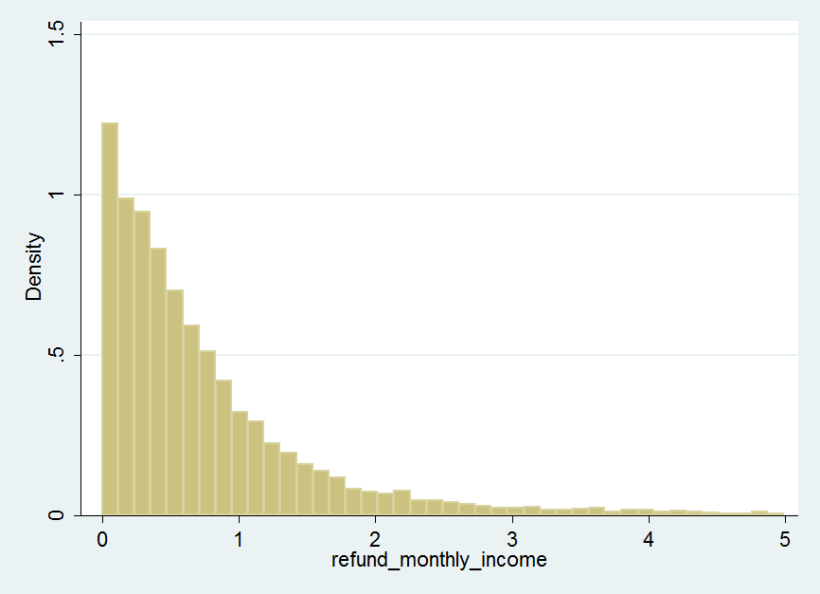
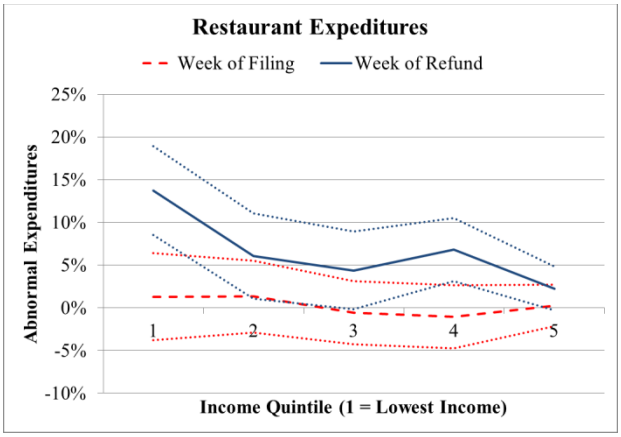
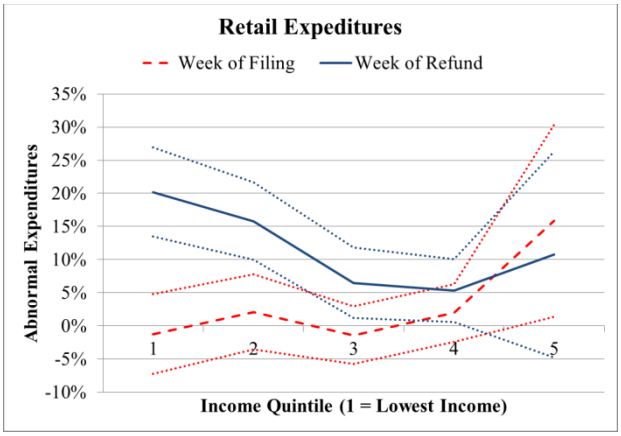
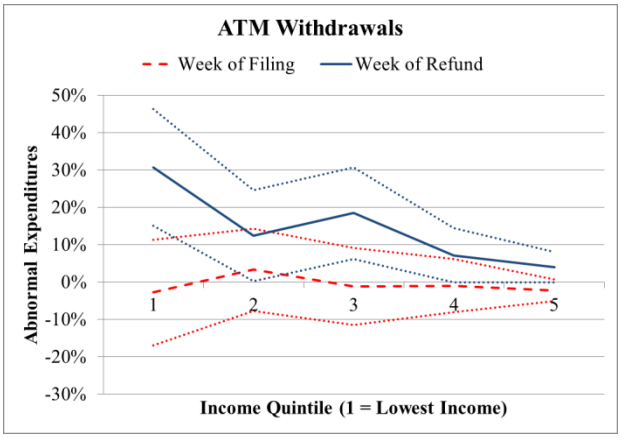


Figure 4: Consumption Response by Income Quintile







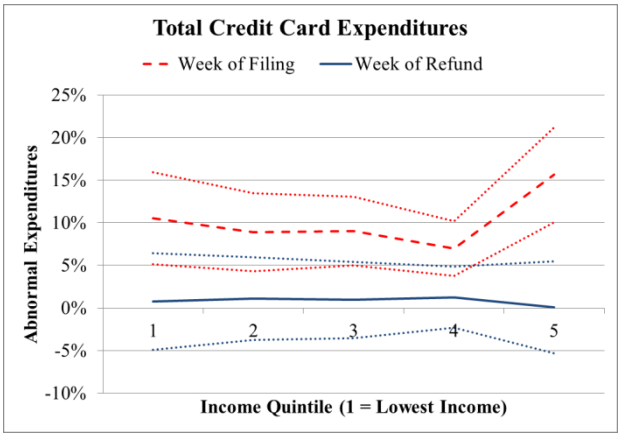
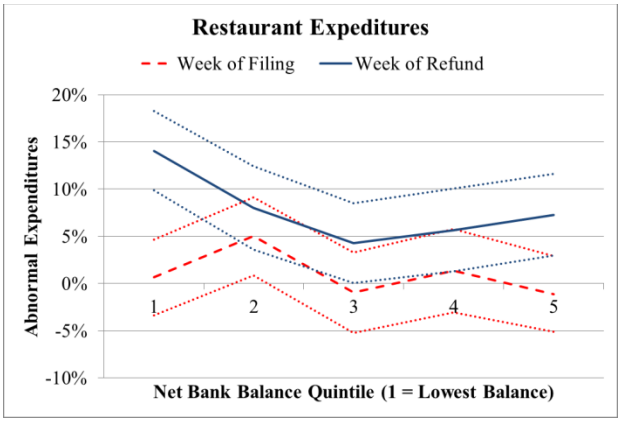
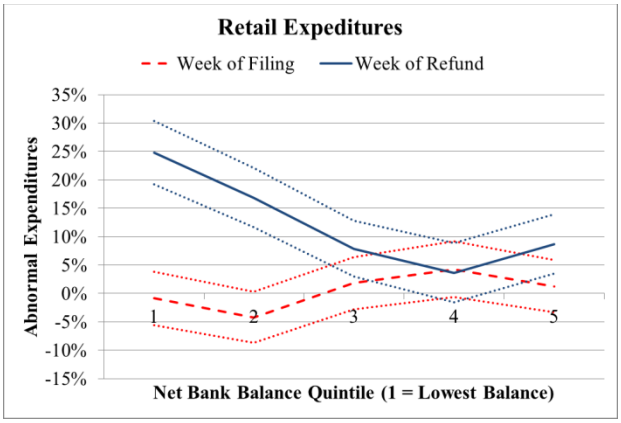
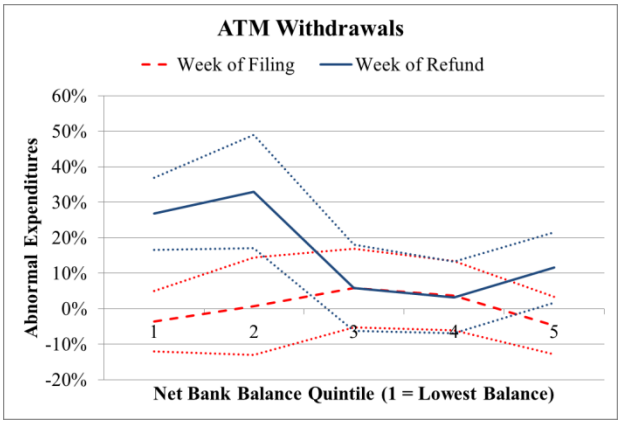


Figure 5: Consumption Response by Net Bank Balance Quintile







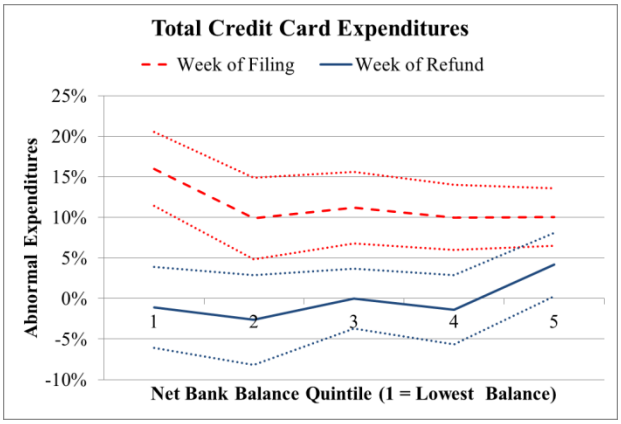


Figure 6: Time Series of Week Dummy Coefficients Surrounding Filing and Refund