Online Only Appendix

Asymmetric Consumption Smoothing

by

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Variable Construction

As described in the main paper, conventional tax refunds and payments are easily identified in the data using the keywords "us treasury des tax," "irs treas des tax," "irs treas tax," and "irs usataxpymt." Our main analysis uses only these. When we predict a refund, we also use refunds paid directly to households by tax preparers. Many tax-preparation software companies, such as TurboTax, allow customers to pay their tax-preparation fees directly from their refund rather than beforehand at the time of filing. In this event, the government first deposits the funds with TurboTax, which extracts the customer's tax-preparation fee plus an additional service charge and then deposits the remaining balance into the customer's bank account. Such transactions are identified in the data by querying for "sbtpg," "tax products p," "block bank des hrbb," "block bank hrbb," and "republic trs."

We construct a savings and debt payment measure as the sum of outflows on the following categories: mortgages, auto loans, net investing (flows to investing accounts minus flows from investing accounts), net credit card payments (credit card payments minus credit card expenditures), and other loan repayments (e.g., student loans). We measure income based on direct deposits, which captures labor income, pension income, and Social Security distributions.

Our data do not directly contain account balances, so we construct two measures from the information we do have. First, we use "net interest earned" as a proxy for each household's liquidity, which we construct as the interest earned on all checking and savings accounts less the interest paid for balances carried on credit card accounts. Second, some "interest earned" transactions include information about the account balance in the text of the transaction description. We extract account balances for about 5% of household-years for which we observe balances in this way for all bank-linked accounts.

Sample Construction and Statistics

We require that the tax filing date precedes the tax refund or tax payment date. However, due to small differences across financial institutions in how quickly transactions post to different accounts, we allow the tax-payment date to precede the tax filing date by no more than two days. Such a scenario would occur if an individual pays a tax-preparation fee with a debit card that takes two days to post while paying their taxes with a credit card that posts immediately. On average, refunds are received 10.2 days after filing, and payments are made 8.6 days after filing.

Relative to U.S. Census data, households in our sample are well dispersed geographically, though we have high concentrations of households in California, New York, and Texas. See a detailed distribution of the sample in Baugh, Ben-David and Park (2018), who use the same broad sample.

The variables described in Table 1 are defined as follows:

- *Filing Date* is the date in which a payment to TurboTax, H&R Block, TaxAct, or TaxSlayer was observed.
- *Ref/Pay Date* is the date in which the household received the refund or made a payment.
- *I(Positive Refund)* is an indicator variable to whether the household received a refund (1) or made a payment (0).
- *Refund − Payment* ($) is the average refund (less payment) amount across household-years.
- *Predicted Refund* ($) shows the average predicted refund size.
- *News Amount* ($) is the difference between the realized refund and the predicted refund. To ensure that the prediction is unbiased, we use households that only make payments or only receive refunds to make this prediction, so the mean is nonzero.
- *Filing to Ref/Pay (days)* is the number of days between filing and the subsequent refund/payment.
- *I(Linked Credit Cards)* is an indicator variable that equals one if the household has one or more credit cards linked to the account aggregator, and zero otherwise.
- *I(Unlinked Credit Cards)* is an indicator variable that equals one if the household has one or more unlinked credit cards, and zero otherwise.
- *I(Any Credit Cards)* is an indicator that equals one if the household has either linked or unlinked credit cards, and zero otherwise.
- *Net Flow* ($) is the difference between inflows and outflows to the core accounts.
- *Consumption* ($) is observed consumption.
- *Scaled Consumption* ($) is the *Consumption* variable scaled up to compensate for the presence of unlinked credit cards.
- *Savings and Loans* ($) shows payments to savings accounts (net investing outflows, net transfers out) and net loan payments (mortgage, auto loan, and net decrease in credit card debt).
- *Misc Payments* ($) is the sum of checks and uncategorized outflows.
- *Income* ($) is observed income.
- *Net Interest* ($), *Interest Expense* ($), and *Interest Earned* ($) are net interest, interest expense, and interest earnings, respectively.

- *Net CC Charge* ($) is all linked credit card expenditures after excluding tax-related transactions (such as filing fees and tax payments made on credit cards).

TABLE A.I— **Summary Statistics: Broader Population**

This table presents summary statistics for our broad sample, which includes households that we never observe making a tax payment and those we never observe receiving a refund. *Refund − Payment* ($) is the average refund (less payment) amount across household-years. *Predicted Refund* ($) shows the average predicted refund size. *News Amount* ($) is the difference between the realized refund and the predicted refund. To ensure that the prediction is unbiased, we use households that only make payments or only have refunds to make this prediction, so the mean is nonzero. *Filing to Ref/Pay (days)* is the number of days between filing and the subsequent payment/refund. *I(Linked Credit Cards)* is an indicator variable that equals one if the household has one or more credit cards linked to the account aggregator, and zero otherwise. *I(Unlinked Credit Cards)* is an indicator variable that equals one if the household has one or more unlinked credit cards, and zero otherwise. *I(Any Credit Cards)* is an indicator that equals one if the household has either linked or unlinked credit cards, and zero otherwise. *Net Flow* ($) is the difference between inflows and outflows to the core accounts. *Consumption* ($) is observed consumption. *Scaled Consumption* ($) is the *Consumption* variable scaled up to compensate for the presence of unlinked credit cards. *Savings and Loans* ($) shows payments to savings accounts (net investing outflows, net transfers out) and net loan payments (mortgage, auto loan, and net decrease in credit card debt). *Misc Payments* ($) is the sum of checks and uncategorized outflows. *Income* ($) is observed income. *Net Interest* ($), *Interest Expense* ($), and *Interest Earned* ($) are net interest, interest expense, and interest earnings, respectively. Finally, *Net CC Charge* ($) is all linked credit card expenditures after excluding tax-related transactions (such as filing fees and tax payments made on credit cards).

Variable	Count	Mean	SD	p1	p10	p25	p50	p75	p90	p99
Households	196,565	–	–	–	–	–	–	–	–	–
Household Days	102,825,086									
Net Flow ($)	102,825,086	−26.90	53,252.32	−3,117.21	−552.10	−182.90	−38.11	0.00	255.01	3,806.85
Consumption ($)	102,825,086	89.87	167.32	0.00	0.00	0.00	28.12	106.30	244.22	838.07
Scaled Consumption ($)	102,825,086	104.31	196.83	0.00	0.00	0.00	31.99	122.23	283.27	989.13
Savings and Loans ($)	102,825,086	31.87	432.58	−754.11	−107.65	−14.00	0.00	0.00	34.00	2,000.00
Misc Payments ($)	102,825,086	82.09	349.92	0.00	0.00	0.00	0.00	29.00	152.92	1,567.25
Income ($)	102,825,086	152.01	699.95	0.00	0.00	0.00	0.00	0.00	0.00	3,404.09
Net Interest ($)	102,825,086	−0.68	8.56	−19.16	0.00	0.00	0.00	0.00	0.00	0.51
Interest Expense ($)	102,825,086	0.77	8.97	0.00	0.00	0.00	0.00	0.00	0.00	19.21
Interest Earned ($)	102,825,086	0.07	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.53
Net CC Charge ($)	102,825,086	41.99	147.04	0.00	0.00	0.00	0.00	21.73	114.43	631.39
Household-Years	307,702	–	–	–	–	–	–	–	–	–
Filing Date	307,702	Mar 03	28.85	Jan 15	Jan 28	Feb 06	Feb 26	Apr 02	Apr 14	Apr 19
Refund/Payment Date	307,702	Mar 14	28.28	Jan 30	Feb 07	Feb 18	Mar 09	Apr 11	Apr 21	May 07
I(Positive Refund)	307,702	0.90	0.31	0.00	0.00	1.00	1.00	1.00	1.00	1.00
Refund − Payment ($)	307,702	2,338.82	2,568.28	−4,490.00	−27.00	746.00	1,904.00	3,826.00	5,896.00	8,964.00
Predicted Refund ($)	307,702	2,338.82	1,641.87	−1,065.10	746.71	1,239.58	1,987.74	3,305.70	4,699.90	6,787.12
News Amount ($)	307,702	0.00	1,974.92	−5,953.01	−2,011.60	−845.86	−114.73	926.72	2,284.45	5,414.51
Filing to Ref/Pay (days)	307,702	10.20	10.16	−1.00	3.00	6.00	7.00	12.00	18.00	60.00
I(Linked Credit Cards)	307,702	0.73	0.44	0.00	0.00	0.00	1.00	1.00	1.00	1.00
I(Unlinked Credit Cards)	307,702	0.84	0.37	0.00	0.00	1.00	1.00	1.00	1.00	1.00
I(Any Credit Cards)	307,702	0.95	0.22	0.00	1.00	1.00	1.00	1.00	1.00	1.00

TABLE A.II— **Cumulative Changes as a Percentage of Refund or Payment**

This table shows the cumulative response (in percentage of refund or payment) of different account measures to expected payments and refunds. The cumulative response is calculated from day −29, i.e., one month prior to the payment or refund. The cumulative response is calculated as $\sum_{k=-29}^{\kappa} \gamma_k^+$ and $\sum_{k=-29}^{\kappa} \gamma_k^-$, for different horizons κ from the estimation of equation (3) on the measure of consumption spending. Standard errors, shown in parentheses, are clustered by the household-year and calendar day.

	Panel A: Percent of Payment				Panel B: Percent of Refund			
	Days after Payment				Days after Refund			
	0	28	56	84	0	28	56	84
(Unscaled) Consumption	−0.05	−0.17	−0.65	−0.54	0.44	6.28	8.90	10.91
	(0.48)	(0.89)	(1.37)	(1.85)	(0.35)	(0.73)	(1.13)	(1.52)
Unlinked CC Payments	−0.01	−0.50	−1.48	−1.32	0.26	5.40	6.13	6.81
	(0.62)	(1.20)	(1.75)	(2.36)	(0.41)	(0.81)	(1.13)	(1.42)
Savings Loans	−4.82	−4.74	−3.83	−3.25	0.33	14.28	13.57	13.15
	(2.52)	(4.78)	(6.98)	(9.12)	(1.00)	(2.14)	(3.28)	(4.51)
Misc Payments	−1.37	6.20	3.66	2.88	0.07	9.89	12.52	14.50
	(1.55)	(3.04)	(4.43)	(5.88)	(0.85)	(1.67)	(2.45)	(3.23)
Net Interest	0.02	0.03	0.02	0.03	0.00	0.03	0.10	0.15
	(0.02)	(0.03)	(0.05)	(0.07)	(0.02)	(0.03)	(0.04)	(0.05)
Income	−4.72	−16.72	−26.79	−33.72	0.10	−1.54	−1.78	−0.58
	(7.02)	(13.84)	(20.54)	(26.97)	(2.75)	(5.57)	(9.25)	(12.95)
Net Flow	19.54	−99.27	−114.98	−138.11	22.96	100.05	108.72	127.25
	(27.70)	(54.16)	(80.79)	(106.54)	(9.28)	(18.25)	(26.78)	(36.02)

FIGURE A.I. **Consumption Response for Households Not Making Small Payments or Receiving Small Refunds**

The figure shows the consumption response to making tax payments (panels A and C) and the arrival of tax refunds (panels B and D). The sample includes all household-years for which the payment or refund is greater than $2,000 in magnitude, resulting in a sample of 21,476 household-years. Panels A and B show the response of all transactions classified as consumption. Panels C and D show the subset of transactions classified as restaurants; the x-axis represents the number of days before or after the tax payment or receipt of refund. The y-axis shows the change in consumption as a percentage of the payment amount (> 0) or refund amount. These responses are computed from equation 3. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

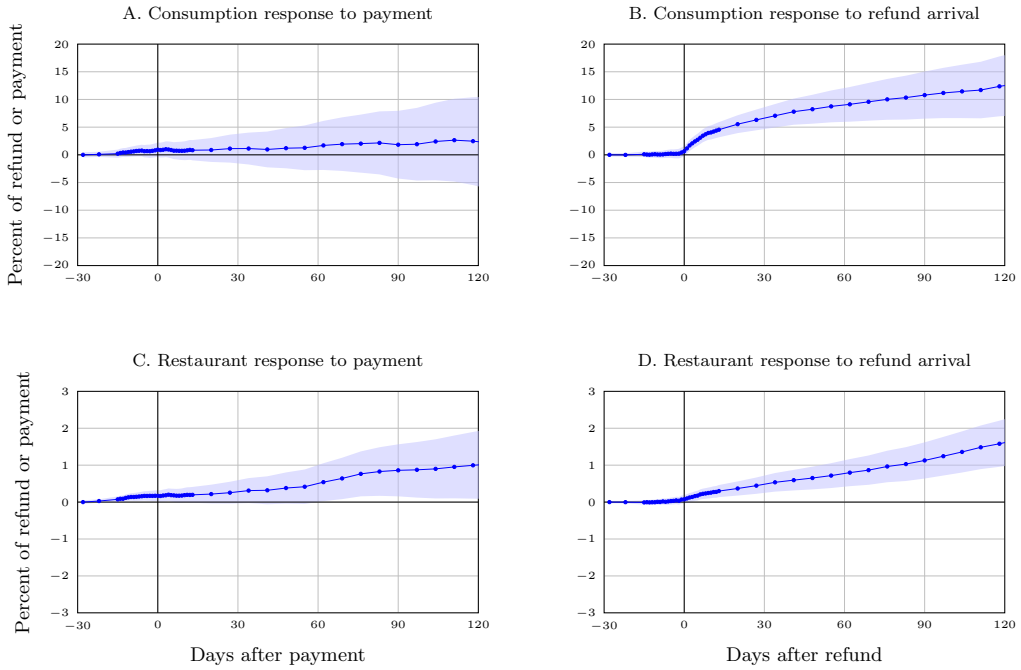

FIGURE A.II. **Consumption Response for Households That Never Have Small Payments or Refunds**

The figure shows the consumption response to making tax payments (panels A and C) and the arrival of tax refunds (panels B and D). The sample removes all households that have ever had a payment or refund less than $2,000 in magnitude, resulting in a sample of 2,764 household-years. Panels A and B show the response of all transactions classified as consumption. Panels C and D show the subset of transactions classified as restaurants. The x-axis represents the number of days before or after the tax payment or receipt of refund. The y-axis shows the change in consumption as a percentage of the payment amount (> 0) or refund amount. These responses are computed from equation 3. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

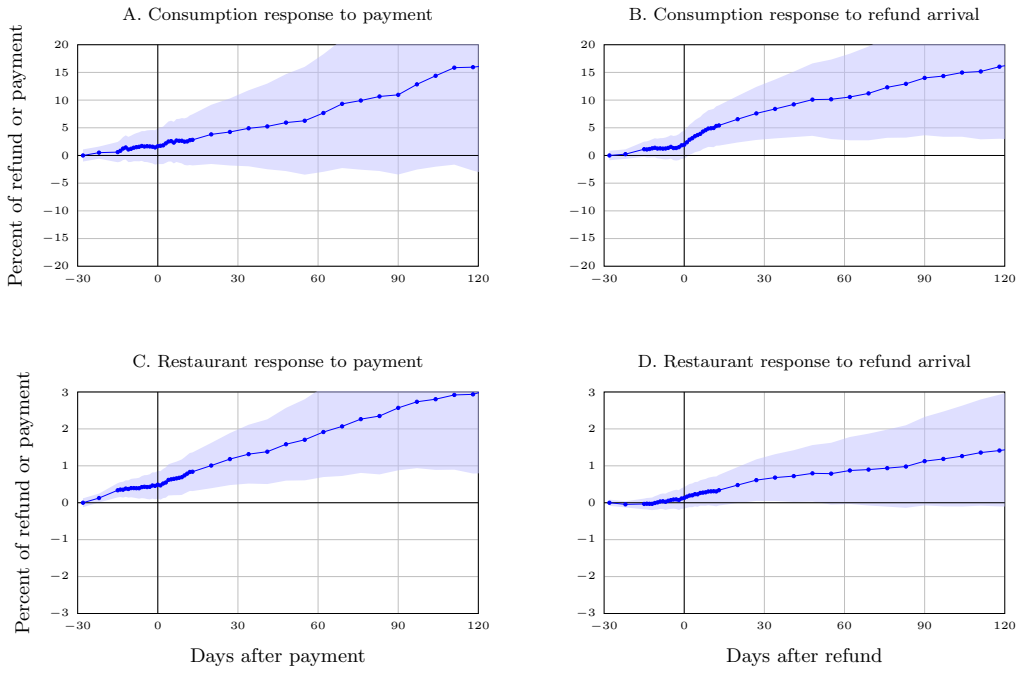

FIGURE A.III. **Consumption Responses Controlling for Household-Level Day and Month Spending Patterns across Years and in a Large Sample of Households**

The figure shows the consumption response to making tax payments (panels A and C) and the arrival of tax refunds (panels B and D). Panels A and B show the response of all transactions classified as consumption. Panels C and D show the subset of transactions classified as restaurants. Unlike the other figures, these responses are not computed from equation 3. Rather, we estimate these responses without filing or news independent variables. Further, we introduce several new fixed effects into this specification: household × calendar month, household × day of week, household × first three days of month, household × last three days of month, and household × 14th to 16th of month. Due to these household fixed effects, we require each household to have at least three years of data in our sample. After applying the above filters, our sample consists of 34,999 household-years. The x-axis represents the number of days before or after the tax payment or receipt of refund. The y-axis shows the change in consumption as a percentage of the payment amount (> 0) or refund amount. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

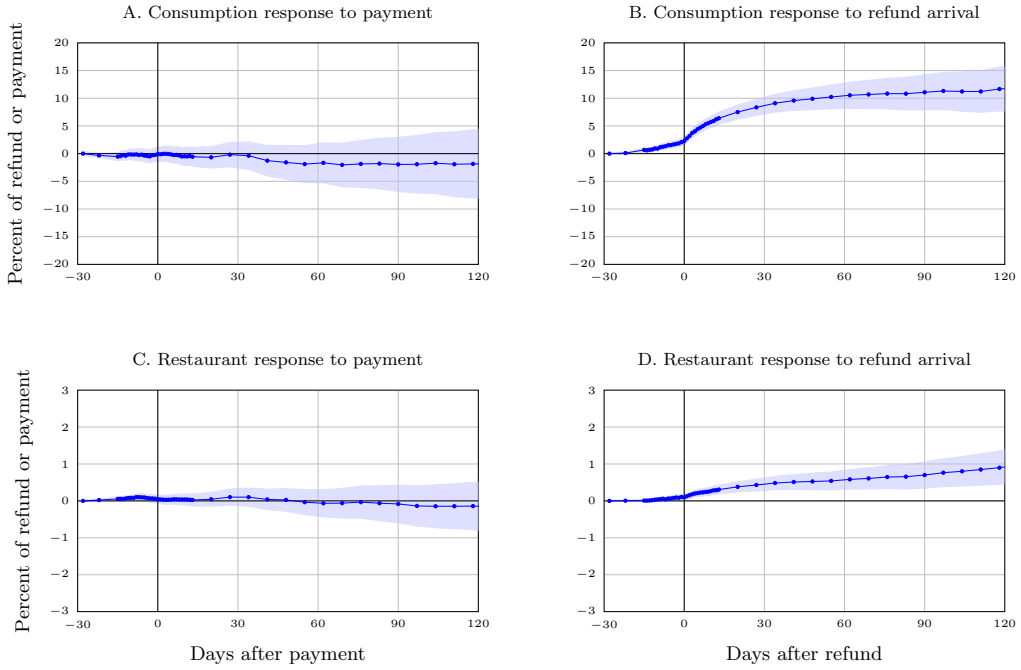

FIGURE A.IV. **Consumption Response to Payment of Taxes and Arrival of Refunds in the Broad Sample of Accounts**

The figure shows the consumption response to making tax payments (panels A and C) and the arrival of tax refunds (panels B and D). Panels A and B show the response of all transactions classified as consumption. Panels C and D show the subset of transactions classified as restaurants. The x-axis represents the number of days before or after the tax payment or receipt of refund. The y-axis shows the change in consumption as a percentage of the payment amount (> 0) or refund amount. These responses are computed from equation 3. In this figure, we alleviate the requirement that households make a payment in at least one year and receive a refund in at least one year. The resultant sample consists of 307,702 household-years. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

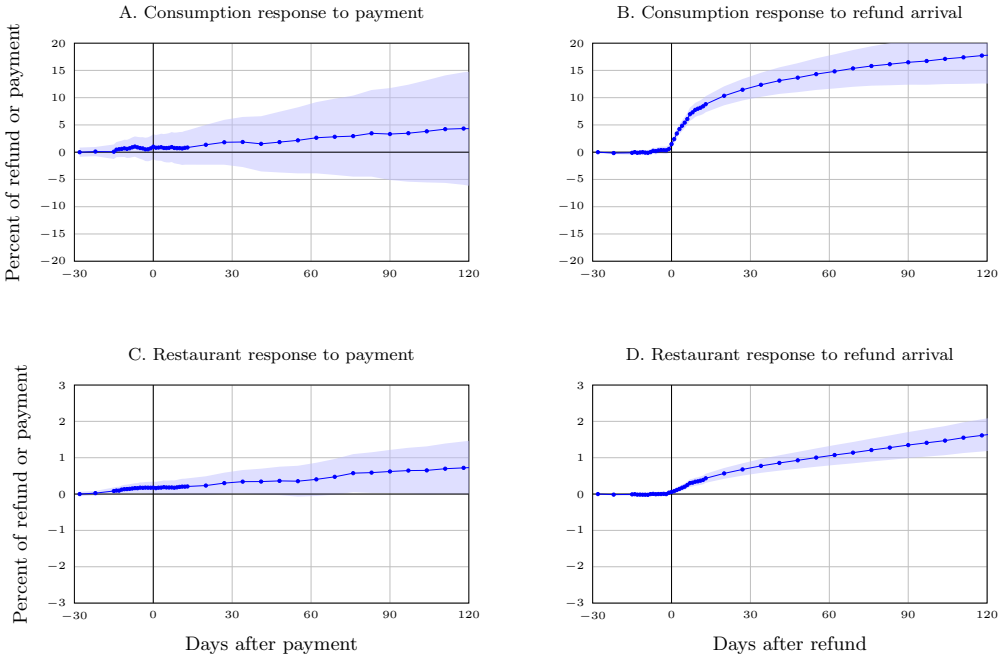

FIGURE A.V. **Consumption Response for Households with Low Liquidity as Measured by Net Interest**

Panels A and B show the abnormal consumption around tax payment and refund dates, as a function of payment and refund amounts for household-years with low liquidity based on net interest received during November, December, and January preceding tax season. For households in our final sample (those that make tax payments in some years and receive tax refunds in other years), we take the bottom tercile of net interest earned, resulting in a sample of 18,285 household-years with an average net interest earned of negative $77.40 per month. For households in our broader sample, we take the top quintile of net interest earned, resulting in a sample of 49,101 household-years with an average net interest earned of negative $111.61 per month. Since interest rates on checking/savings are close to zero over this time period, this implies a revolving credit card balance of roughly $500 ($600 in the broad sample). The markers denote averages at every 5% of the data for those who received refunds, and every 10% of the data for those who made payments. Panels C and D show the cumulative response of external savings and debt payments to making tax payments and receiving refunds, respectively; the horizontal axes measure days since payment or refund arrival. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

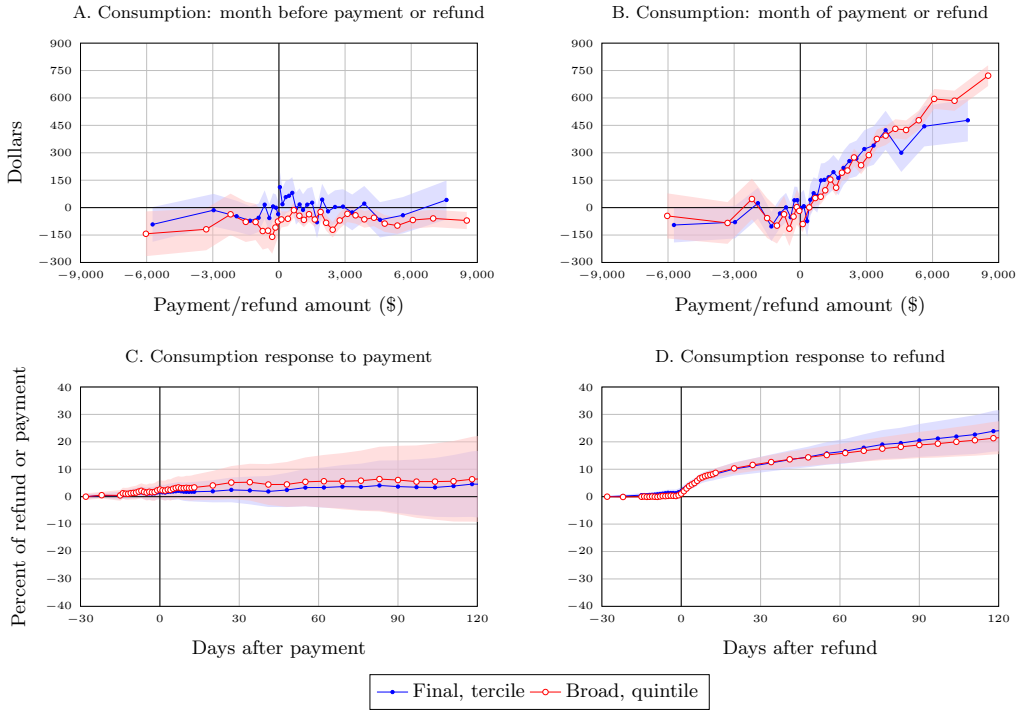

FIGURE A.VI. **Consumption Response for Households with High Liquidity as Measured by Net Interest**

Panels A and B show the abnormal consumption around tax payment and refund dates, as a function of payment and refund amounts for household-years with high liquidity based on net interest received during the November, December, and January preceding tax season. For households in our final sample (those that make tax payments in some years and receive tax refunds in other years), we take the top tercile of net interest earned, resulting in a sample of 18,277 household-years with an average net interest earned of $9.87 per month. For households in our broader sample, we take the top quintile of net interest earned, resulting in a sample of 49,090 household-years with an average net interest earned of $10.89 per month. Because interest rates on checking/savings are close to zero over this time period, this cutoff suggests a balance of at least roughly $500 ($600 in the broad sample). The markers denote averages at every 5% of the data for those who received refunds and at every 10% of the data for those who made payments. Panels C and D show the cumulative response of external saving and debt payment to making tax payments and receiving refunds, respectively. The horizontal axes measure days before or after payment or refund arrival. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

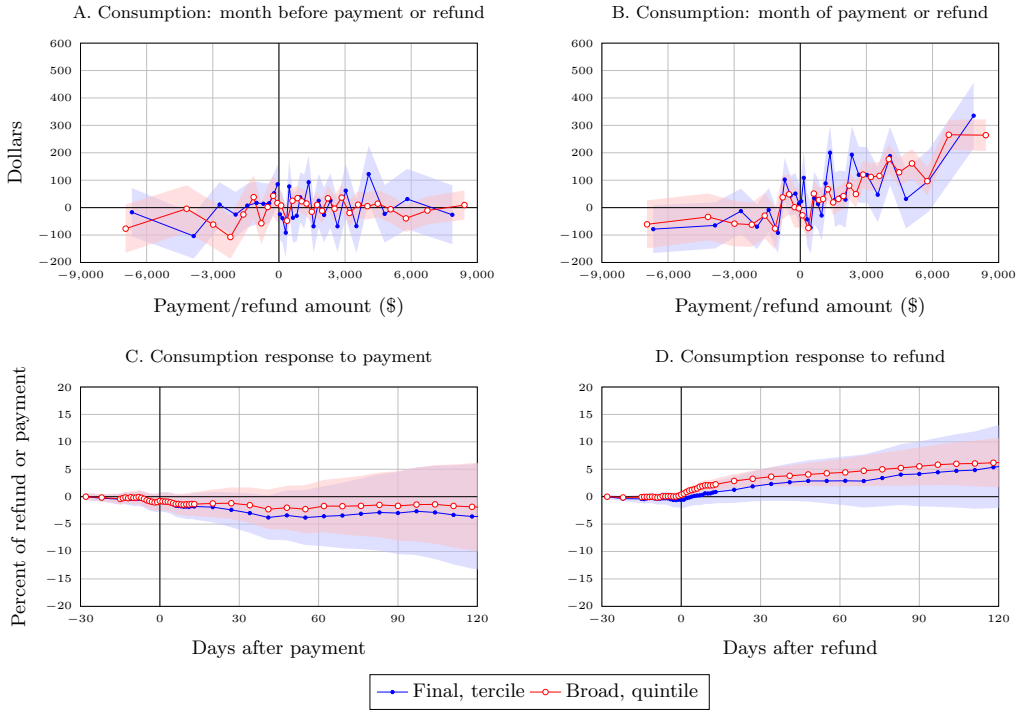

FIGURE A.VII. **Funds Transfers in Response to News about Tax Amount (Final Sample Only)**

The figure shows the fund transfer response around negative and positive news. Panels A and C show the response around negative news. Panels B and D show the response around positive news. Panels A and B show the response for all household-years. Panels C and D show the response of household-years with small amounts of expected payments or refunds, defined as being the bottom quintile of absolute expected refunds or payments. The x-axis represents the number of days after households filed their tax returns. The y-axis shows the dollars response per $100 payment or refund. The response is computed from equation 3. The shaded areas represent two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.

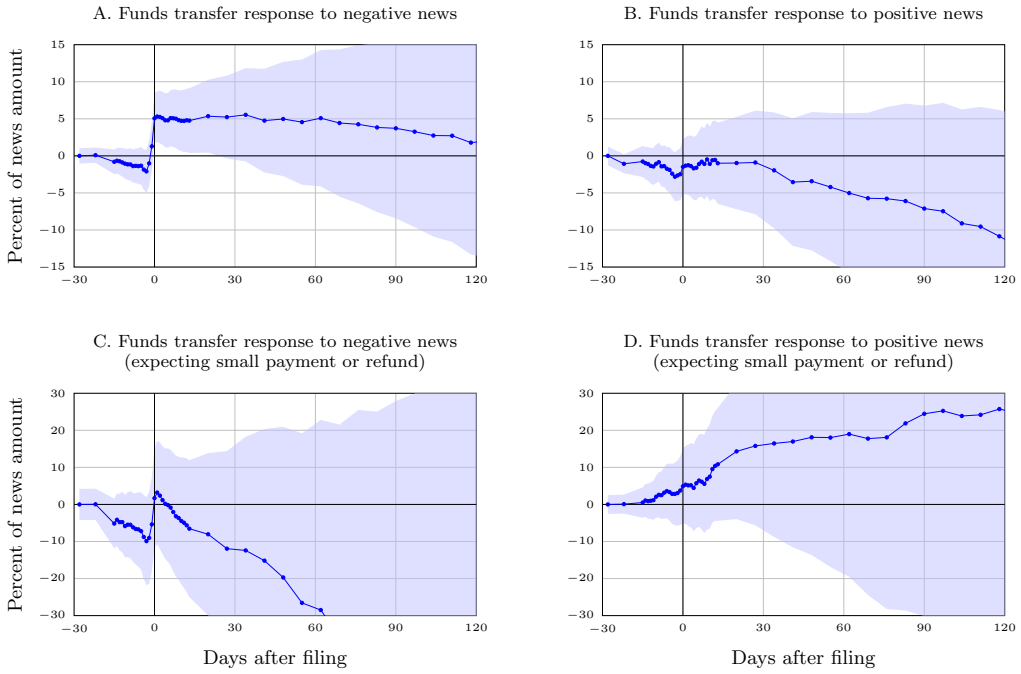

FIGURE A.VIII. **Consumption Response Around News During Tax Preparation (Final Sample Only)**

The figure shows the consumption response around negative and positive news. Panels A and C show the response around negative news. Panels B and D show the response around positive news. Panels A and B show the response for all household-years. Panels C and D show the response of household-years with small amounts of expected payments or refunds, defined as being the bottom quintile of the absolute expected refunds or payments. The x-axis represents the number of days before or after households filed their tax returns. The y-axis shows the dollar response per \$100 payment or refund. The response is computed from equation 3. The shaded areas represent two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.