Unpublished Appendix

# Asymmetric Consumption Smoothing

by

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## Table A.I. Summary Statistics: Broader Population

This table presents summary statistics for our broad sample, which includes households that either make a tax payment or receive a tax 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-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 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 ($) | 307,702 | 0.00 | 1,974.92 | -5,953.01 | -2,011.60 | -845.86 | -114.73 | 926.72 | 2,284.45 | 5,414.51 |
| Filing to Ref/Pay (days) | 307,702 | 10.20 | 10.16 | -1.00 | 3.00 | 6.00 | 7.00 | 12.00 | 18.00 | 60.00 |
| I(Linked Credit Cards) | 307,702 | 0.73 | 0.44 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| I(Unlinked Credit Cards) | 307,702 | 0.84 | 0.37 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| I(Any Credit Cards) | 307,702 | 0.95 | 0.22 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Household Days | 102,825,086 | | | | | | | | | |
| Net Flow ($) | 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 Exp ($) | 102,825,086 | 0.77 | 8.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 19.21 |
| Interest Ear ($) | 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 |

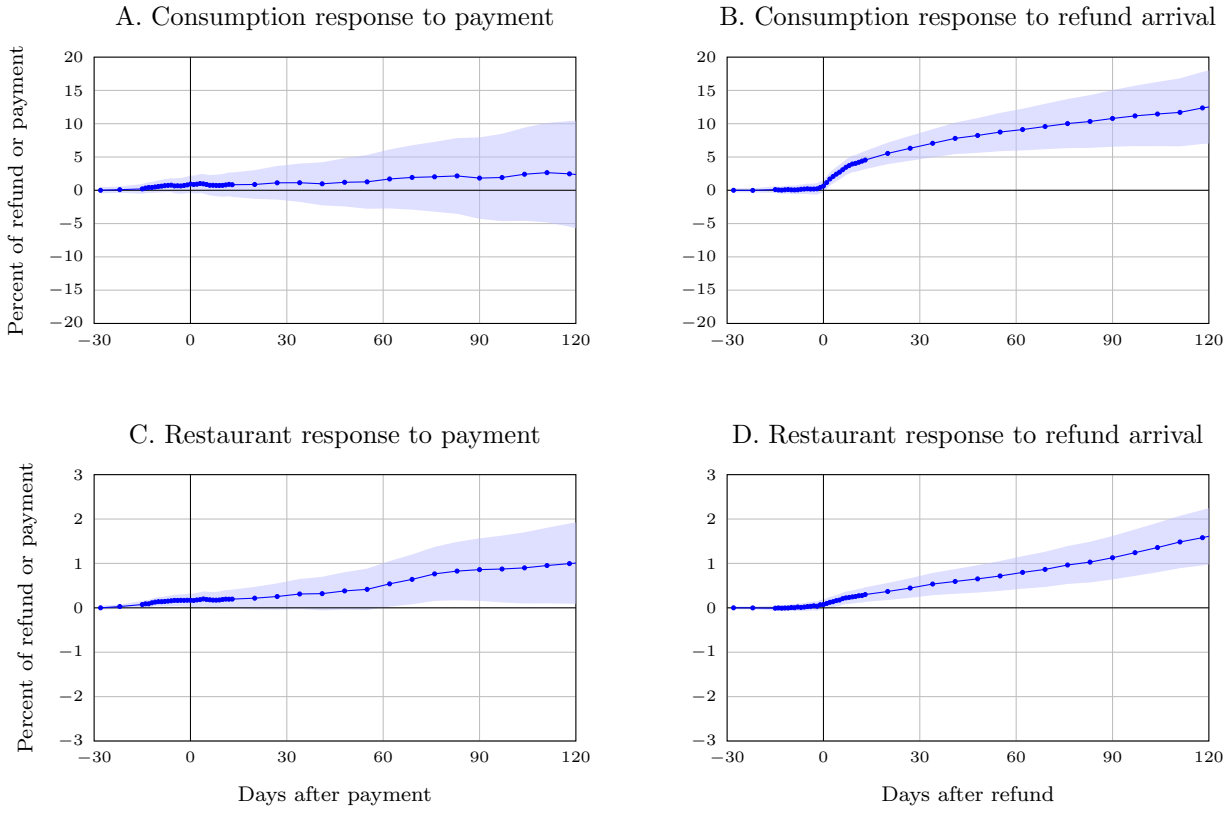
## Table A.II. Cumulative Changes as a Percentage of Refund or Payment

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 $\kappa$ from the estimation of equation 3 on the measure of consumption spending. Standard errors, shows 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) |

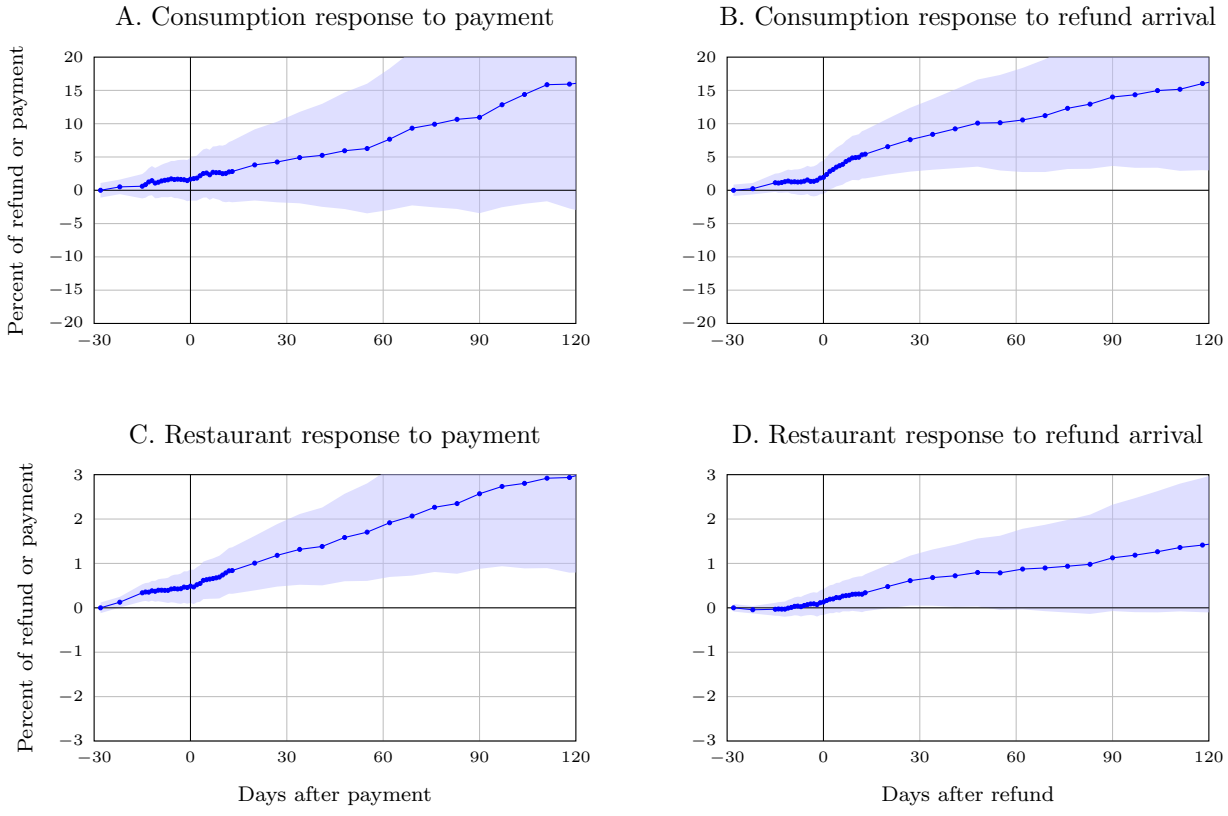
## Figure A.I. Consumption Response for Households Not Making Small Payments or Receiving Small Refunds

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 after the tax payment or receipt of refund. The $y$-axis shows the propensity to spend out of payment or refund. 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.



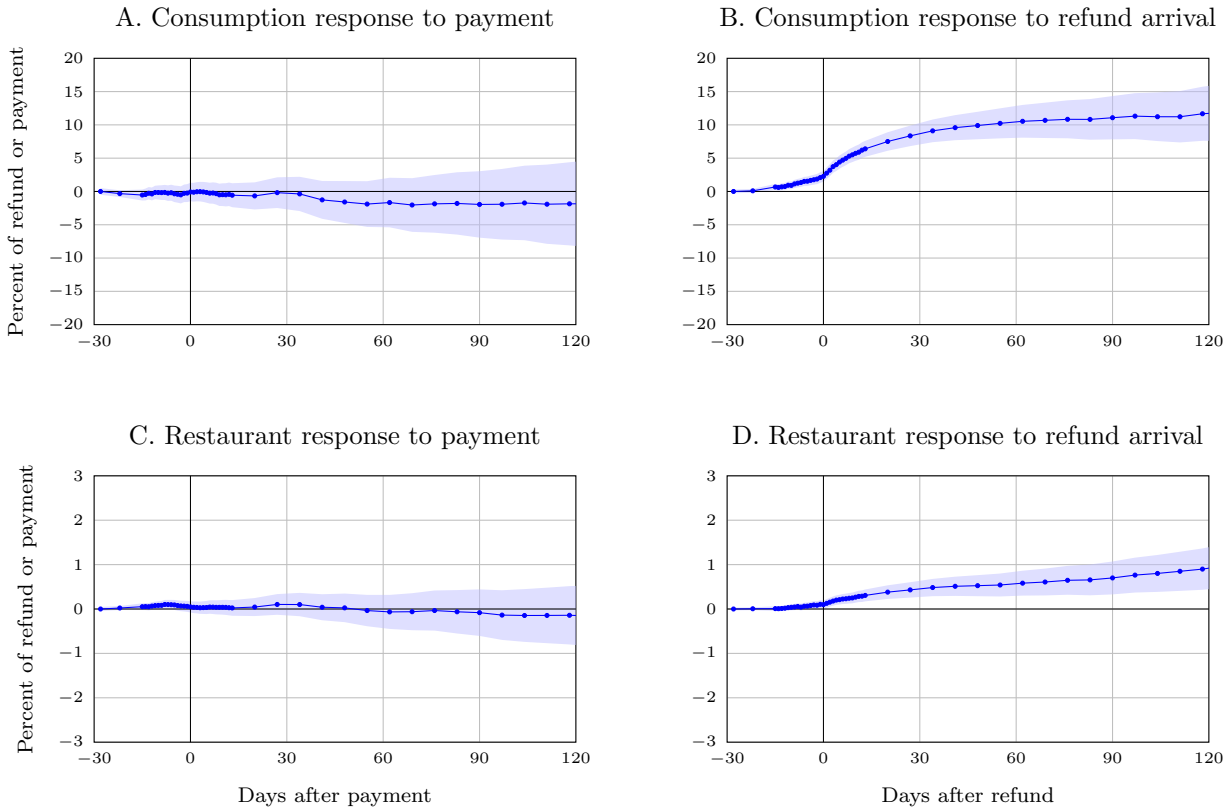
## Figure A.II. Consumption Response for Households That Never Have Small Payments or Refunds

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 after the tax payment or receipt of refund. The $y$-axis shows the propensity to spend out of payment or refund. 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.



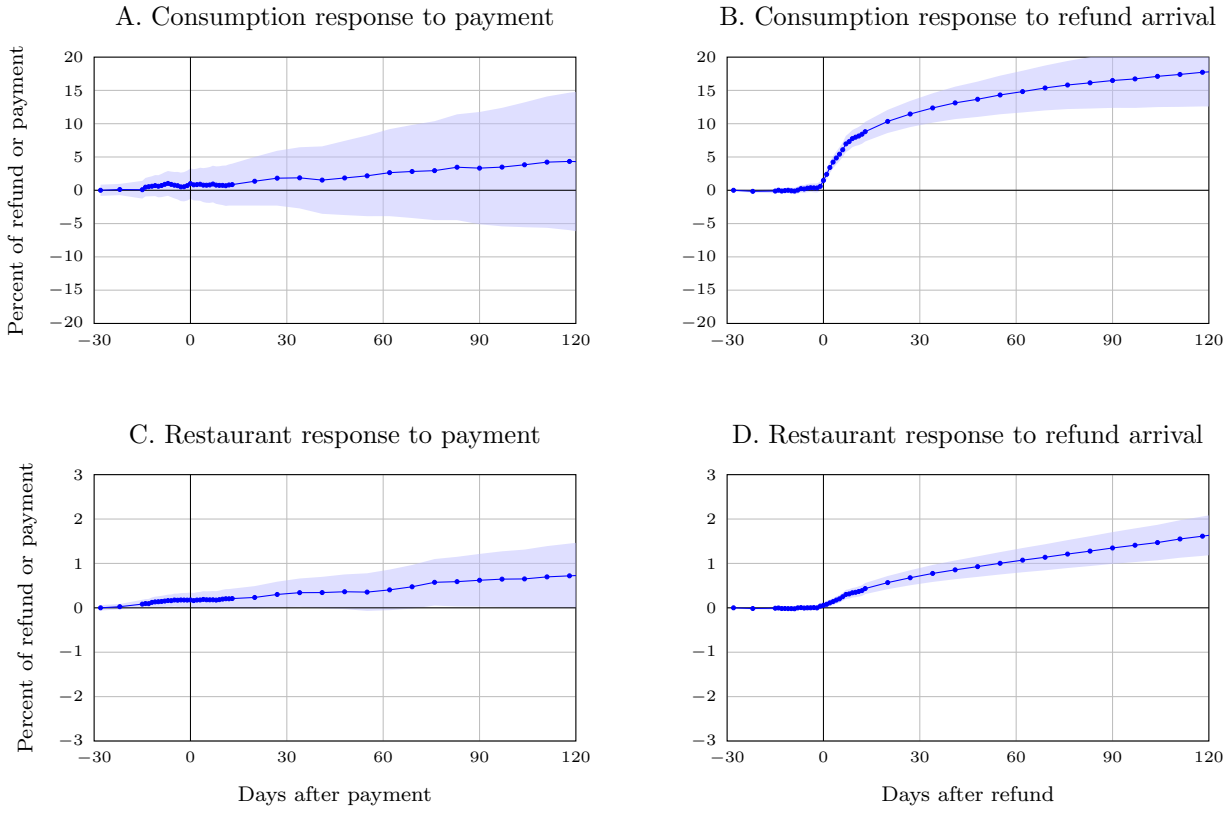
## Figure A.III. Consumption Responses Controlling for Household-Level Day and Month Spending Patterns across Years and in a Large Sample of Households

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 after the tax payment or receipt of refund. The $y$-axis shows the propensity to spend out of payment or refund. The shaded region represents two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.



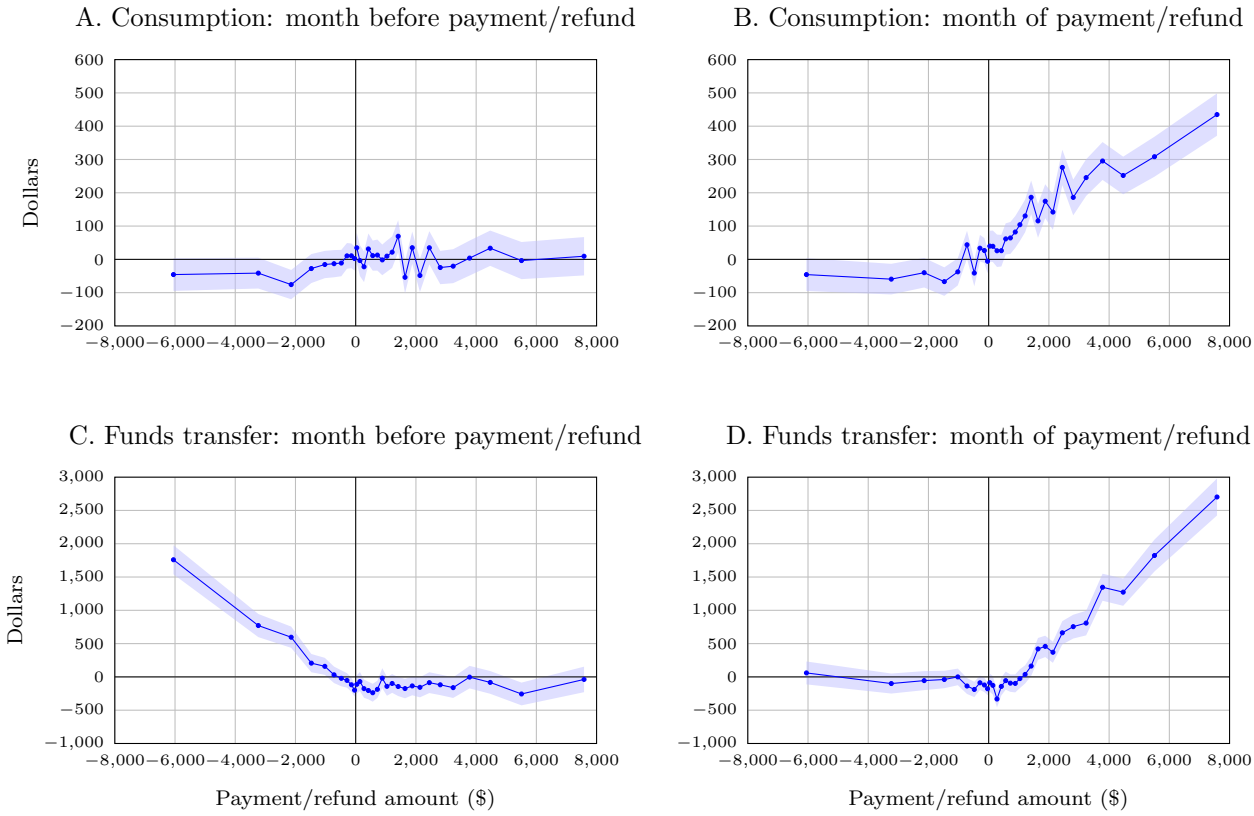
## Figure A.IV. Consumption Response to Payment of Taxes and Arrival of Refunds in the Broad Sample of Accounts

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 after the tax payment or receipt of refund. The $y$-axis shows the propensity to spend out of payment or refund. 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.



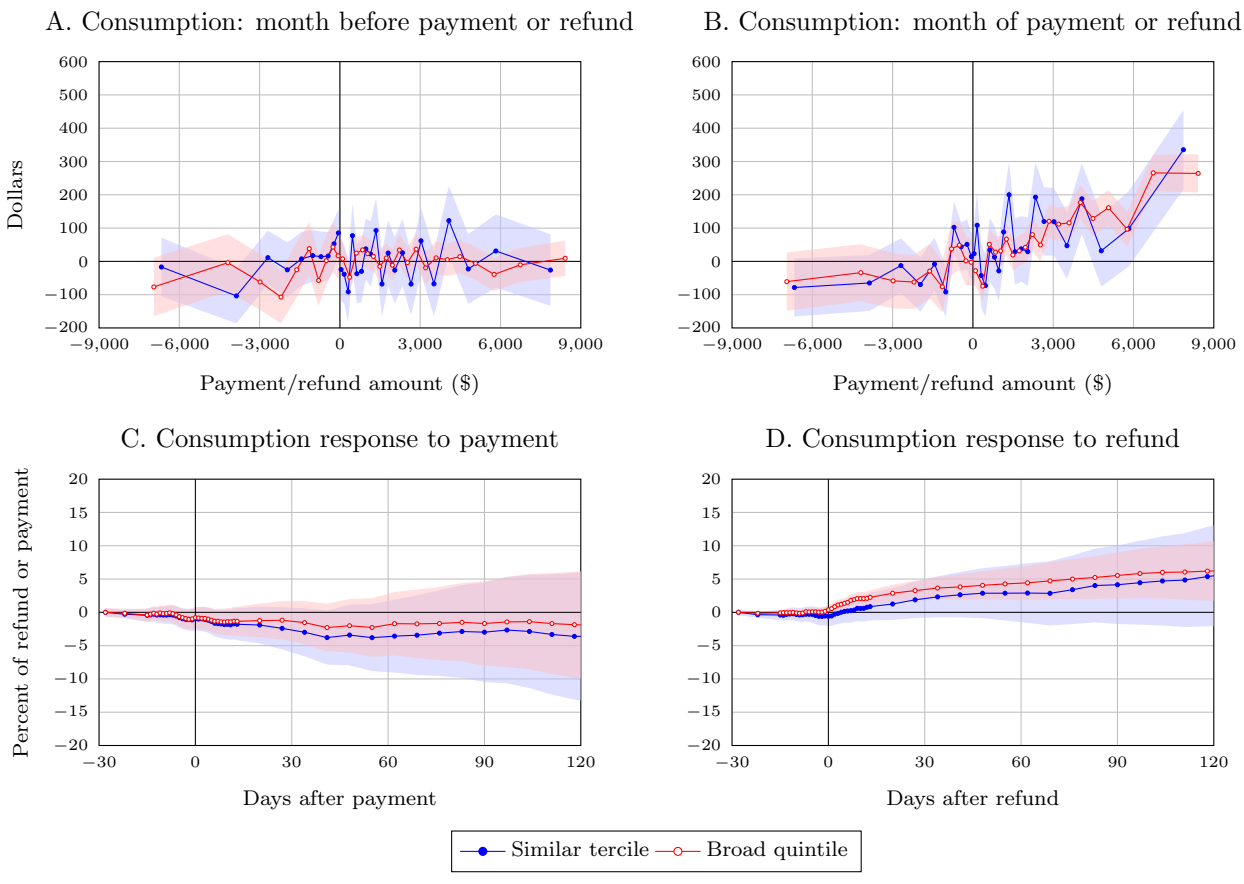
## Figure A.V. Consumption Response for Households with Low Liquidity as Measured by Net Interest

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 similar 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 saving and debt payment 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.



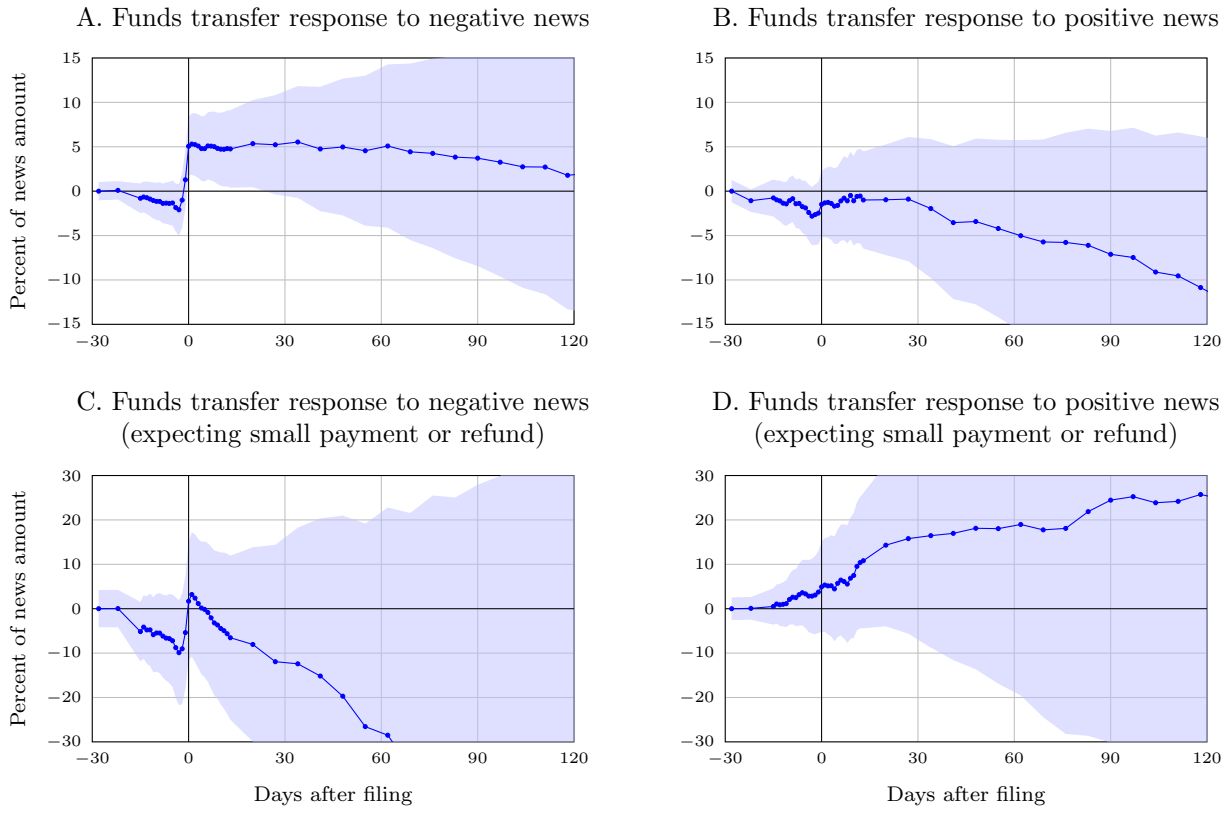
## Figure A.VI. Consumption Response for Households with High Liquidity as Measured by Net Interest

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 similar 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 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 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.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 dotted lines 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 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 dotted lines represent two standard errors confidence intervals. Standard errors are doubled-clustered at the household-year and at the calendar-date levels.