Response of Consumption to Income Shocks

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Random-Walk Hypothesis

- Consumption Euler equation with uncertainty:

\[ U'(C_t) = \beta(1 + r)E_t[U'(C_{t+1})] \]

- with \( \beta(1 + r) = 1 \):

\[ U'(C_t) = E_t[U'(C_{t+1})] \]

- Marginal utility is a martingale:
  - Best current predictor of tomorrow’s marginal utility is today’s marginal utility
Suppose marginal utility is linear (i.e., quadratic utility):

\[ C_t = E_t C_{t+1} \]

Consumption a martingale!!
Suppose marginal utility is linear (i.e., quadratic utility):

\[ C_t = E_t C_{t+1} \]

Consumption a martingale!!

This is Robert Hall’s (1978) random walk hypothesis

- Very controversial at the time
- Seems “obvious” today
  (Are we too conditioned by our models?)
Random Walk Hypothesis

\[ E_t C_{t+1} = C_t \]
\[ C_{t+1} = C_t + \epsilon_{t+1} \]

where \( \epsilon_{t+1} = C_{t+1} - E_t C_{t+1} \)

- Two important properties of \( \epsilon_{t+1} \):
  - Since it is an expectations error, it is uncorrelated with information known at time \( t \) or earlier
  - It is proportional to the innovation to the consumer’s present value of life-time income ("permanent income" for short)
**Random Walk Hypothesis**

In infinite horizon case:

\[ C_t = \frac{r}{1 + r} \left( A_t + \sum_{j=0}^{\infty} (1 + r)^{-j} E_t Y_{t+j} \right) \]

\[ \Delta C_{t+1} = \epsilon_{t+1} = \frac{r}{1 + r} \sum_{j=0}^{\infty} (1 + r)^{-j} \Delta E_{t+1} Y_{t+1+j} \]

where \( \Delta E_{t+1} Y_{t+1+j} = E_{t+1} Y_{t+1+j} - E_t Y_{t+1+j} \)
Empirical Implications

- Response to anticipated changes in income: Zero
- Response to transitory unanticipated change in income: Small
  - Marginal propensity to consume
  - Something like 2-5% per year
- Response to permanent unanticipated change in income: Large
  - 1% permanent increase in income raises “permanent income” by 1%
    (ignoring assets) and should therefore raise consumption by 1%
Early Tests

- Random walk hypothesis implies that consumption growth should be unpredictable. I.e., unforecastable using lagged variables

- Suggests following regression test:

\[ \Delta C_{t+1} = \alpha + X_t \beta + \epsilon_{t+1} \]

where \( X_t \) is a set of regressors known at time \( t \) and the test is \( \beta = 0 \)

- Hall (1978) performed tests along these lines:
  - Failed to reject for lagged values of income and consumption
  - Rejected using lagged value of stock market
  - Interpreted results in favor of hypothesis
Rejections in early tests hard to interpret
- Are they economically meaningful?
- Even very accurate models can be rejected with enough data

Useful to have a specific alternative hypothesis

Two types of consumers:
- Fraction $\lambda$ are “hand-to-mouth”, i.e., consumer their income
- Fraction $1 - \lambda$ are rational PIH consumers
Implies

$$\Delta C_t = \lambda \Delta Y_t + (1 - \lambda) \epsilon_t$$

i.e., consumption growth is a weighted average of income growth and growth in permanent income

Important complication:

- $\Delta Y_t$ and $\epsilon_t$ are likely correlated. Why?
Implies

\[ \Delta C_t = \lambda \Delta Y_t + (1 - \lambda) \epsilon_t \]

i.e., consumption growth is a weighted average of income growth and growth in permanent income

Important complication:

- \( \Delta Y_t \) and \( \epsilon_t \) are likely correlated. Why?
- Recall that \( \epsilon_t \) denotes innovations to permanent income
- Changes in current income likely correlated with innovations to permanent income
An IV Approach

\[ \Delta C_t = \lambda \Delta Y_t + (1 - \lambda)\epsilon_t \]

- Can we think of instruments that will work in this case?
  (Hint: Error term is an expectation error)
An IV Approach

\[ \Delta C_t = \lambda \Delta Y_t + (1 - \lambda) \epsilon_t \]

- Can we think of instruments that will work in this case?
  (Hint: Error term is an expectation error)
- Any variable known at time \( t - 1 \) works as an instrument
- Since \( \epsilon_t \) is an expectation error, it is orthogonal to all variables known at time \( t - 1 \) or earlier
- So, we can use lags of anything as instruments
  (Wow, lots of possible instruments)
Consumption homoskedastic in logs rather than levels
  - Regression in levels would suffer from heteroskedasticity
  - Campbell-Mankiw take logs (i.e., log-linear approximation)
  - Alternative to divide through by, e.g., $C_{t-1}$

$C_t$ is a time average over a quarter
  - Even if $C_t$ were a random walk, time averaging would imply serial correlation of changes (Working, 1960)
  - Campbell and Mankiw (1989) lag instruments by 2 periods to avoid this
We obtain stronger results in row 4 and 5 of the table, where we use lagged consumption growth rates as instruments. It is striking that lagged consumption forecasts income growth more strongly than lagged income itself does, and this enables us to estimate the parameter $A$ more precisely. This finding suggests that at least some consumers have better information on future income growth than is summarized in its past history and that they respond to this information by increasing their consumption. At the same time, however, the fraction of rule-of-thumb consumers is estimated at 0.523 in row 5 (and the estimate is significant at better than the 0.01% level). The OLS test also rejects the permanent income model in row 5.

Table 1

<table>
<thead>
<tr>
<th>Row</th>
<th>Instruments</th>
<th>$\Delta c$ equation</th>
<th>$\Delta y$ equation</th>
<th>$\lambda$ estimate (s.e.)</th>
<th>Test of restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None (OLS)</td>
<td>—</td>
<td>—</td>
<td>0.316 (0.040)</td>
<td>—</td>
</tr>
<tr>
<td>2</td>
<td>$\Delta y_{t-2}, \ldots, \Delta y_{t-4}$</td>
<td>-0.005 (0.500)</td>
<td>0.009 (0.239)</td>
<td>0.417 (0.235)</td>
<td>-0.022 (0.944)</td>
</tr>
<tr>
<td>3</td>
<td>$\Delta y_{t-2}, \ldots, \Delta y_{t-6}$</td>
<td>0.017 (0.209)</td>
<td>0.026 (0.137)</td>
<td>0.506 (0.176)</td>
<td>-0.034 (0.961)</td>
</tr>
<tr>
<td>4</td>
<td>$\Delta c_{t-2}, \ldots, \Delta c_{t-4}$</td>
<td>0.024 (0.101)</td>
<td>0.045 (0.028)</td>
<td>0.419 (0.161)</td>
<td>-0.009 (0.409)</td>
</tr>
<tr>
<td>5</td>
<td>$\Delta c_{t-2}, \ldots, \Delta c_{t-6}$</td>
<td>0.081 (0.007)</td>
<td>0.079 (0.007)</td>
<td>0.523 (0.131)</td>
<td>-0.016 (0.572)</td>
</tr>
<tr>
<td>6</td>
<td>$\Delta i_{t-2}, \ldots, \Delta i_{t-4}$</td>
<td>0.061 (0.010)</td>
<td>0.028 (0.082)</td>
<td>0.698 (0.235)</td>
<td>-0.016 (0.660)</td>
</tr>
<tr>
<td>7</td>
<td>$\Delta i_{t-2}, \ldots, \Delta i_{t-6}$</td>
<td>0.102 (0.002)</td>
<td>0.082 (0.006)</td>
<td>0.584 (0.137)</td>
<td>-0.025 (0.781)</td>
</tr>
<tr>
<td>8</td>
<td>$\Delta y_{t-2}, \ldots, \Delta y_{t-4}$</td>
<td>0.007 (0.341)</td>
<td>0.068 (0.024)</td>
<td>0.351 (0.119)</td>
<td>-0.033 (0.840)</td>
</tr>
<tr>
<td></td>
<td>$\Delta c_{t-2}, \ldots, \Delta c_{t-4}$</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>$c_{t-2} - y_{t-2}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>$\Delta y_{t-2}, \ldots, \Delta y_{t-4}$</td>
<td>0.078 (0.026)</td>
<td>0.093 (0.013)</td>
<td>0.469 (0.106)</td>
<td>-0.029 (0.705)</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

Note: The columns labeled “First-stage regressions” report the adjusted $R^2$ for the OLS regressions of the two variables on the instruments; in parentheses is the p-value for the null that all the coefficients except the constant are zero. The column labeled “$\lambda$ estimate” reports the IV estimate of $\lambda$ and, in parentheses, its standard error. The column labeled “Test of restrictions” reports the adjusted $R^2$ of the OLS regression of the residual on the instruments; in parenthesis is the p-value for the null that all the coefficients are zero.

Source: Campbell and Mankiw (1989)
MAIN TAKEAWAYS

- Estimate $\lambda$ of roughly 0.5
- Strongly reject $\lambda = 0$ (random walk hypothesis)
- Lagged income growth weak instruments
- Lagged consumption growth much stronger instruments
  - Consumption seems to encode information about future income growth
- This type of rejection of random walk hypothesis is often referred to as “excess sensitivity”
LIMITATIONS OF MACRO-DATA TESTS

- Few observations
- Difficult to find variables with much predictive power for income
- Rely on strong assumption that $\epsilon_t$ is only a expectations error
  - If not true, hard to find a valid instrument
- Rely on strong aggregation assumptions
  (see, e.g., Attanasio and Weber, 1993, 1995)
Large literature has analyzed anticipated changes in income at the household level:

- Wilcox (1989): Preannounced increases in social security benefits
- Parker (1999): Reaching Social Security payroll cap
- Souleles (1999): Receipt of tax refund
- Souleles (2002): Reagan tax cuts
- Parker, Souleles, Johnson, McClelland (2013): 2008 tax rebate
All these income changes are pre-announced

But many were (likely) not very salient to households
  - I received 2008 in the mail and was pleasantly surprised

Does it matter whether consumers knew?
All these income changes are pre-announced
But many were (likely) not very salient to households
  - I received 2008 in the mail and was pleasantly surprised
Does it matter whether consumers knew?
If transitory, probably not that much
  - Don’t affect permanent income much
  - MPC out of transitory income shock should be very small
If persistent (Wilcox 89, Souleles 02) matters more
Economic Stimulus Act of February 2008

$100 billion of tax rebates to 130 million US tax filers

- Single filers received $300-$600
  (max of $300 and tax liability up to $600)
- Couples received $600-$1200
- Fazed out for incomes above $75,000 ($150,000 for couples)
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  (max of $300 and tax liability up to $600)
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Timing of dispersement based on last two digits of SSN
  (effectively random)

Compare spending of households that received payment at different dates
Routing number (i.e., for direct deposit of a tax refund), the stimulus payments were disbursed electronically over a three-week period ranging from late April to mid-May. For households that did not provide a routing number, the payments were mailed using paper checks over a nine-week period ranging from early May through early July. The IRS mailed a notice to the ESP recipients in advance of sending the payments. Importantly, within each disbursement method, the particular timing of the payment was determined by the last two digits of the recipients' Social Security numbers, which are effectively randomly assigned.

In aggregate the stimulus payments in 2008 were historically large, amounting to about $100 billion, which in real terms is about double the size of the 2001 rebate program. According to the Department of the Treasury (2008), $79 billion in ESPs was disbursed in the second quarter of 2008, which corresponds to about 2.2 percent of GDP or 3.1 percent of PCE in that quarter. During the third quarter, $15 billion in ESPs was disbursed, corresponding to about 0.4 percent of GDP or 0.6 percent of PCE.

The stimulus payments constituted about two-thirds of the total ESA package, which also included various business incentives and foreclosure relief. This article focuses on the stimulus payments, as recorded in our CE dataset.

9 Payments were directly deposited only to personal bank accounts. Payments were mailed to tax filers who had provided the IRS with their tax preparer's routing number, e.g., as part of taking out a "refund anticipation loan." Such situations are common, representing about a third of the tax refunds delivered via direct deposit in 2007.

10 Due to the electronic deposits, about half of the aggregate stimulus payments were disbursed by the end of May. While most of the rest of the payments came in June and July, taxpayers who filed their 2007 return late could receive their payment later than the above schedule. Since about 92 percent of taxpayers typically file at or before the normal April 15th deadline (Slemrod et al. 1997), this source of variation is small. Nonetheless, we present results below that exclude such late payments.

11 For paper checks, the notices were mailed about a week before the checks were mailed. For EFTs, the notices were sent a couple of business days before the direct deposits were supposed to be credited. The recipients' banks were also notified a couple of days before the date of the electronic transfers, and some banks might have credited some of the electronic payments to the recipients' accounts a day or more before the official payment date. For example, some EFTs that had been scheduled to be deposited on Monday, April 28 were reported to the banks on Thursday April 24, and some banks appear to have credited recipients' accounts on Friday, April 25.

12 For more details on ESA, see, e.g., Sahm, Shapiro, and Slemrod (2010).

### Table 1—The Timing of the Economic Stimulus Payments of 2008

<table>
<thead>
<tr>
<th>Payments by electronic funds transfer</th>
<th>Payments by mailed check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last two digits of taxpayer SSN</td>
<td>Date ESP funds transferred to account by</td>
</tr>
<tr>
<td>00–20</td>
<td>May 2</td>
</tr>
<tr>
<td>21–75</td>
<td>May 9</td>
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<tr>
<td>76–99</td>
<td>May 16</td>
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</tbody>
</table>

Source: Internal Revenue Service (http://www.irs.gov/newsroom/article/0,,id=180247,00.html).

Source: Parker et al. (2013)
Nature of Income Shock

- Should be anticipated (program highly publicized)
  - Consumption response should be a lower bound on response of an unanticipated income change
  - Some of the effect may have occurred upon announcement

- Totally transitory
Main data source: Consumer Expenditure Survey
Households surveyed 4 times with 3 month intervals about spending over past 3 months
New households added each month
Main data source: Consumer Expenditure Survey

Households surveyed 4 times with 3 month intervals about spending over past 3 months

New households added each month

Authors worked with BLS to add questions about receipt of stimulus payments
  - Did they receive stimulus payment?
  - When did they receive it?
  - How much did they receive?
Empirical Specification

\[ C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} \times month_{s,i} + \beta_1' X_{i,t} + \beta_2 ESP_{i,t+1} + u_{i,t+1} \]

- Dependent variable: 3-month change in consumption
- Independent variable of interest: \( ESP_{i,t+1} \)
Empirical Specification

\[ C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} \times month_{s,i} + \beta'_1 X_{i,t} + \beta_2 ESP_{i,t+1} + u_{i,t+1} \]

- Dependent variable: 3-month change in consumption
- Independent variable of interest: \( ESP_{i,t+1} \)
- Time dummies:
  - Soaks up all aggregate effects
    (GE effects, anticipation effects)
  - Identification comes from cross section
    Comparison of those that get \( ESP \) at time \( t + 1 \) and those that don’t
Empirical Specification

\[ C_{i,t+1} - C_{i,t} = \sum_s \beta_{0s} \times \text{month}_{s,i} + \beta'_1 X_{i,t} + \beta_2 \text{ESP}_{i,t+1} + u_{i,t+1} \]

- Dependent variable: 3-month change in consumption
- Independent variable of interest: \( \text{ESP}_{i,t+1} \)
- Time dummies:
  - Soaks up all aggregate effects
    - (GE effects, anticipation effects)
  - Identification comes from cross section
    - Comparison of those that get \( \text{ESP} \) at time \( t + 1 \) and those that don’t
- \( X_{i,t} \) to soak up some variation from error term
Table 2—The Contemporaneous Response of Expenditures to ESP Receipt among All Households

<table>
<thead>
<tr>
<th></th>
<th>Food OLS</th>
<th>Strictly nondurables OLS</th>
<th>Nondurable spending OLS</th>
<th>All CE goods and services OLS</th>
<th>Food OLS</th>
<th>Strictly nondurables OLS</th>
<th>Nondurable spending OLS</th>
<th>All CE goods and services OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A. Dollar change in spending</strong></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>ESP</td>
<td>0.016</td>
<td>0.079</td>
<td>0.121</td>
<td>0.516</td>
<td>10.9</td>
<td>74.8</td>
<td>121.5</td>
<td>494.5</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.046)</td>
<td>(0.055)</td>
<td>(0.179)</td>
<td>(31.7)</td>
<td>(56.6)</td>
<td>(67.2)</td>
<td>(207.2)</td>
</tr>
<tr>
<td>I(ESP)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
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<td>(67.2)</td>
<td>(207.2)</td>
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<tr>
<td><strong>Panel B. Percent change in spending</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ESP</td>
<td>0.012</td>
<td>0.079</td>
<td>0.128</td>
<td>0.523</td>
<td>0.012</td>
<td>0.079</td>
<td>0.128</td>
<td>0.523</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.060)</td>
<td>(0.071)</td>
<td>(0.219)</td>
<td>(0.033)</td>
<td>(0.060)</td>
<td>(0.071)</td>
<td>(0.219)</td>
</tr>
<tr>
<td>I(ESP)</td>
<td>0.69</td>
<td>1.74</td>
<td>2.09</td>
<td>3.24</td>
<td>0.69</td>
<td>1.74</td>
<td>2.09</td>
<td>3.24</td>
</tr>
<tr>
<td></td>
<td>(1.27)</td>
<td>(0.96)</td>
<td>(0.94)</td>
<td>(1.17)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Notes: All regressions also include a full set of month dummies, age, change in the number of adults, and change in the number of children following equation (1). Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. The coefficients in panel B are multiplied by 100 so as to report a percent change. The last four columns report results from 2SLS regressions where the indicator variable for ESP receipt and the other regressors are used as instruments for the amount of the ESP. All regressions use 17,478 observations except for the first two columns of panel B which have only 17,427 and 17,475, respectively.

Source: Parker et al. (2013)
Types of Variation: First Pass

- Timing of payments is random
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- Timing of payments is random
- How much a person got is not random
  - Correlated with income
  - Possible that this is correlated with error term
    (if high income people did relatively well or badly in this period)
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- Timing of payments is random
- How much a person got is not random
  - Correlated with income
  - Possible that this is correlated with error term
    (if high income people did relatively well or badly in this period)
- 2nd set of results use \( I(ESP > 0) \)
  (i.e., only whether household received ESP, not how much)
This section estimates the change in consumption expenditures caused by receipt of a stimulus payment during the three-month period of receipt, using the contemporaneous payment variables $ESP_t + 1$ and $I(ESP_t + 1 > 0)$ in equation (1). Following JPS, we begin by estimating the average $\beta_2$ using all available variation in the full sample and subsequently refine our identification strategy by dropping nonrecipients and late recipients from our sample, and by using only the variation in the timing of ESP receipt within each method of disbursement (check versus EFT). The subsequent section estimates the lagged response to the payments.

A. Variation across All Households

In Table 2, the first set of four columns display the results of estimating equation (1) by ordinary least squares (OLS), with the dollar change in consumption expenditures as the dependent variable and the contemporaneous amount of the payment ($ESP_t$) as the key independent variable. The resulting estimates of $\beta_2$ measure the average fraction of the payment spent on the different expenditure aggregates in each column, within the three-month reference period in which the payment was received.

<table>
<thead>
<tr>
<th>Panel A. Dollar change in spending</th>
<th>Panel B. Percent change in spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ESP$</td>
<td>$ESP$</td>
</tr>
<tr>
<td>0.016 (0.027)</td>
<td>0.012 (0.033)</td>
</tr>
<tr>
<td>0.079 (0.046)</td>
<td>0.079 (0.060)</td>
</tr>
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<td>0.128 (0.071)</td>
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<td>$I(ESP)$</td>
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</tr>
<tr>
<td>10.9 (31.7)</td>
<td>0.69 (1.27)</td>
</tr>
<tr>
<td>74.8 (56.6)</td>
<td>1.74 (0.96)</td>
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  - Correlated with income
  - Possible that this is correlated with error term
    (if high income people did relatively well or badly in this period)
- 2nd set of results use \( I(ESP > 0) \)
  (i.e., only whether household received ESP, not how much)
- Panel C uses 2SLS with \( I(ESP > 0) \) as an instrument for \( ESP_{i,t+1} \)
  - First stage: \( ESP_{i,t+1} \) on \( I(ESP > 0) \)
  - Reduced form: \( C_{i,t+1} - C_i,t \) on \( I(ESP > 0) \)
  - IV is ratio of these two
This section estimates the change in consumption expenditures caused by receipt of a stimulus payment during the three-month period of receipt, using the contemporaneous payment variables $ESP_{t+1}$ and $I(ESP)$ in equation (1). Following JPS, we begin by estimating the average $\beta_2$ using all available variation in the full sample and subsequently refine our identification strategy by dropping nonrecipients and late recipients from our sample, and by using only the variation in the timing of ESP receipt within each method of disbursement (check versus EFT). The subsequent section estimates the lagged response to the payments.

### Table 2—The Contemporaneous Response of Expenditures to ESP Receipt among All Households

<table>
<thead>
<tr>
<th>Panel A. Dollar change in spending</th>
<th>Panel B. Percent change in spending</th>
<th>Panel C. Dollar change in spending</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food OLS</td>
<td>Strictly nondurables OLS</td>
</tr>
<tr>
<td><strong>ESP</strong></td>
<td>0.016</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.046)</td>
</tr>
<tr>
<td><strong>I(ESP)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Food OLS</td>
<td>Strictly nondurables OLS</td>
</tr>
<tr>
<td><strong>ESP</strong></td>
<td>0.012</td>
<td>0.079</td>
</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td>(0.060)</td>
</tr>
<tr>
<td><strong>I(ESP)</strong></td>
<td>0.69</td>
<td>1.74</td>
</tr>
<tr>
<td></td>
<td>(1.27)</td>
<td>(0.96)</td>
</tr>
</tbody>
</table>

**Notes:** All regressions also include a full set of month dummies, age, change in the number of adults, and change in the number of children following equation (1). Reported standard errors are adjusted for arbitrary within-household correlations and heteroskedasticity. The coefficients in panel B are multiplied by 100 so as to report a percent change. The last four columns report results from 2SLS regressions where the indicator variable for ESP receipt and the other regressors are used as instruments for the amount of the ESP. All regressions use 17,478 observations except for the first two columns of panel B which have only 17,427 and 17,475, respectively.

Source: Parker et al. (2013)
Types of Variation: 2nd Pass

- Timing of payments is random
Types of Variation: 2nd Pass

- Timing of payments is random
- Who got payments is not random
  (again, correlated with income)
Timing of payments is random

Who got payments is not random
(again, correlated with income)

Three approaches:

- Control for receipt of payment
- Only households that received payment
- Only households that reported receiving payment on time
B. Variation among Households That Receive ESPs at Some Time

The results in panel C of Table 2 identify the effect of ESP receipt on spending by comparing the behavior of households that received payments at different times to the behavior of households that did not receive payments during those times. Since some households did not receive any payment, in any period, the results still use some information that comes from comparing households that received payments to households that never received payments. We now investigate the role of this variation using a number of different approaches, for brevity focusing on nondurable expenditures and total expenditures.

First, we add to equation (1) an indicator for households that received a payment in any reference quarter, $I(\text{ESP}_i, t+1 > 0)$ for any $t$, which allows the expenditure growth of payment recipients to differ on average from that of nonrecipients. In this case, the main regressor $I(\text{ESP} > 0)$ captures only higher-frequency variation in the timing of payment receipt—receipt in quarter $t+1$ in particular—conditional on receipt in some quarter. As reported in panel A of Table 3, the estimated coefficients for the effect of the payment ($\text{ESP}$ and $I(\text{ESP} > 0)$) are quite similar to those in Table 2, and the estimated coefficients on $I(\text{ESP}_i, t+1 > 0)$ for any $t$ are statistically insignificant. Hence, apart from the effect of the payment, there is little difference between the expenditure growth of payment recipients and nonrecipients over the

<table>
<thead>
<tr>
<th>Panel A. Sample of all households ($N = 17,478$)</th>
<th>Dollar change in</th>
<th>Percent change in</th>
<th>Dollar change in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nondurable</td>
<td>All CE goods</td>
<td>Nondurable</td>
</tr>
<tr>
<td></td>
<td>spending</td>
<td>and services</td>
<td>spending</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
</tr>
<tr>
<td>ESP</td>
<td>0.117</td>
<td>0.507</td>
<td>0.123</td>
</tr>
<tr>
<td>($0.060$)</td>
<td>($0.196$)</td>
<td>($0.253$)</td>
<td>($0.196$)</td>
</tr>
<tr>
<td>$I(\text{ESP})$</td>
<td>2.63</td>
<td>3.97</td>
<td>($1.07$)</td>
</tr>
<tr>
<td>($1.07$)</td>
<td>($1.34$)</td>
<td>($1.34$)</td>
<td>($1.07$)</td>
</tr>
<tr>
<td>$I(\text{ESP}_i, t &gt; 0$ for any $t$)</td>
<td>9.58</td>
<td>21.21</td>
<td>($0.50$)</td>
</tr>
<tr>
<td>($36.07$)</td>
<td>($104.00$)</td>
<td>($0.50$)</td>
<td>($0.63$)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B. Sample of households receiving ESPs ($N = 11,239$)</th>
<th>Dollar change in</th>
<th>Percent change in</th>
<th>Dollar change in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nondurable</td>
<td>All CE goods</td>
<td>Nondurable</td>
</tr>
<tr>
<td></td>
<td>spending</td>
<td>and services</td>
<td>spending</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
</tr>
<tr>
<td>ESP</td>
<td>0.185</td>
<td>0.683</td>
<td>0.252</td>
</tr>
<tr>
<td>($0.066$)</td>
<td>($0.219$)</td>
<td>($0.103$)</td>
<td>($0.329$)</td>
</tr>
<tr>
<td>$I(\text{ESP})$</td>
<td>3.91</td>
<td>5.63</td>
<td>($1.33$)</td>
</tr>
<tr>
<td>($1.33$)</td>
<td>($1.69$)</td>
<td>($1.69$)</td>
<td>($1.33$)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C. Sample of households receiving only on-time ESPs ($N = 10,488$)</th>
<th>Dollar change in</th>
<th>Percent change in</th>
<th>Dollar change in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nondurable</td>
<td>All CE goods</td>
<td>Nondurable</td>
</tr>
<tr>
<td></td>
<td>spending</td>
<td>and services</td>
<td>spending</td>
</tr>
<tr>
<td></td>
<td>OLS</td>
<td>OLS</td>
<td>OLS</td>
</tr>
<tr>
<td>ESP</td>
<td>0.214</td>
<td>0.590</td>
<td>0.308</td>
</tr>
<tr>
<td>($0.070$)</td>
<td>($0.217$)</td>
<td>($0.112$)</td>
<td>($0.342$)</td>
</tr>
<tr>
<td>$I(\text{ESP})$</td>
<td>4.52</td>
<td>6.05</td>
<td>($1.50$)</td>
</tr>
<tr>
<td>($1.50$)</td>
<td>($1.89$)</td>
<td>($1.89$)</td>
<td>($1.50$)</td>
</tr>
</tbody>
</table>

Source: Parker et al. (2013)
Types of Variation: 2nd Pass

- Timing of payments is random
- Who got payments is not random
  (again, correlated with income)
- Three approaches:
  - Control for receipt of payment
  - Only households that received payment
  - Only households that reported receiving payment on time
- Most of later results with this last sample
- Results significant, but standard errors not trivial
Longer-Term Impact

- Do effects reverse or build over time?
  - Add lagged term to regression
The number of observations for all regressions is 10,488.

Excess Sensitivity

Source: Parker et al. (2013)
Do effects reverse or build over time?
  - Add lagged term to regression
Growth slightly negative in next quarter
But level still above control group
Do effects reverse or build over time?
  - Add lagged term to regression

Growth slightly negative in next quarter

But level still above control group

Point estimate thus suggests higher spending persists and longer term impact bigger than short-term impact

Standard errors large
Compare share of increase with share of spending
Keeping in mind the degree of statistical significance, our finding of a large spending response on new cars is suggestive of an important role for liquidity constraints. The ESPs may have provided otherwise unavailable down payments for debt-financed purchases of cars. In this case, whether this spending on autos would be reversed in the short term would depend on whether the ESPs caused all households to on average buy a car a few months sooner, leading to no subsequent short-term decline in aggregate demand, or whether those whose ESPs did not cause them to purchase a car immediately instead spent their ESPs on other items and were constrained and unable to purchase cars a few months later, leading to a reversal in demand.

In contrast, a back-of-the-envelope calculation suggests that models of inattention seem unlikely to explain the results for autos. Under inattention, broadly speaking, some households can be surprised by their receipt of an ESP. To illustrate Table 7—The Propensity to Spend on Subcategories of Expenditures

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Panel A. Food</th>
<th>Panel B. Additional categories in strictly nondurables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient on ESP</td>
<td>0.050</td>
<td>0.059</td>
</tr>
<tr>
<td>Standard error</td>
<td>(0.032)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Implied share of increase in nondurable spending</td>
<td>0.16</td>
<td>0.19</td>
</tr>
<tr>
<td>Share of avg. spending on subcategory</td>
<td>0.23</td>
<td>0.23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C. Additional categories in nondurables</th>
<th>Panel D. Additional categories in total CE spending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dollar change in spending on:</td>
<td>Housing (incl. furnishings)</td>
</tr>
<tr>
<td>Apparel</td>
<td>0.022</td>
</tr>
<tr>
<td>Health</td>
<td>0.025</td>
</tr>
<tr>
<td>Reading</td>
<td>−0.001</td>
</tr>
<tr>
<td>Coefficient on ESP</td>
<td>0.099</td>
</tr>
<tr>
<td>Standard error</td>
<td>(0.001)</td>
</tr>
<tr>
<td>Implied share of increase in:</td>
<td>Nondurable spending</td>
</tr>
<tr>
<td>Nondurable spending</td>
<td>0.07</td>
</tr>
<tr>
<td>Durable spending</td>
<td>0.08</td>
</tr>
<tr>
<td>Avg. spending on subcategory:</td>
<td></td>
</tr>
<tr>
<td>Share of nondurable</td>
<td>0.06</td>
</tr>
<tr>
<td>Share of durable</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Source: Parker et al. (2013)
What Did They Spend It On?

- Compare share of increase with share of spending
- For non-durables: alcohol, personal care, tobacco, apparel
Keeping in mind the degree of statistical significance, our finding of a large spending response on new cars is suggestive of an important role for liquidity constraints. The ESPs may have provided otherwise unavailable down payments for debt-financed purchases of cars. In this case, whether this spending on autos would be reversed in the short term would depend on whether the ESPs caused all households on average to buy a car a few months sooner, leading to no subsequent short-term decline in aggregate demand, or whether those whose ESPs did not cause them to purchase a car immediately instead spent their ESPs on other items and were constrained and unable to purchase cars a few months later, leading to a reversal in demand.

In contrast, a back-of-the-envelope calculation suggests that models of inattention seem unlikely to explain the results for autos. Under inattention, broadly speaking, some households can be surprised by their receipt of an ESP. To illustrate,

### Table 7—The Propensity to Spend on Subcategories of Expenditures

<table>
<thead>
<tr>
<th>Panel</th>
<th>Dependent variable:</th>
<th>Food at home</th>
<th>Food away from home</th>
<th>Alcoholic beverages</th>
<th>Utilities, household operations</th>
<th>Personal care and misc.</th>
<th>Gas, motor fuel, public transportation</th>
<th>Tobacco products</th>
</tr>
</thead>
</table>

| | Coefficient on ESP | 0.050 | 0.025 | 0.011 | 0.059 | 0.083 | 0.027 | 0.007 |
| | Standard error | (0.032) | (0.033) | (0.007) | (0.027) | (0.049) | (0.039) | (0.009) |

| | Implied share of increase in nondurable spending | 0.16 | 0.08 | 0.04 | 0.19 | 0.27 | 0.09 | 0.02 |
| | Share of avg. spending on subcategory | | | | | | | |

<table>
<thead>
<tr>
<th>Panel</th>
<th>Dollar change in spending on:</th>
<th>Apparel</th>
<th>Health</th>
<th>Reading</th>
<th>Housing (incl. furnishings)</th>
<th>Entertainment</th>
<th>Education</th>
<th>Transportation</th>
</tr>
</thead>
</table>

| | Coefficient on ESP | 0.022 | 0.025 | 0.001 | 0.099 | 0.077 | 0.100 | 0.527 |
| | Standard error | (0.021) | (0.048) | (0.003) | (0.092) | (0.099) | (0.042) | (0.269) |

| | Implied share of increase in: | Nondurable spending | Durable spending | Avg. spending on subcategory |
| | Coefficient on ESP | 0.07 | 0.15 | 0.01 | 0.56 | 0.13 | 0.04 | 0.27 |

Source: Parker et al. (2013)
WHAT DID THEY SPEND IT ON?

- Compare share of increase with share of spending
- For non-durables: alcohol, personal care, tobacco, apparel
- For durables: cars

Large effect on cars suggests ESP provided down payment for debt-financed cars (alleviated liquidity constraints)

Possible reversal for cars:
- Did it move everyone forward a few months (no reversal)?
- Or did those that didn’t buy immediately, spend it on something else and become liquidity constrained again (subsequent reversal)?
What Did They Spend It On?

- Compare share of increase with share of spending
- For non-durables: alcohol, personal care, tobacco, apparel
- For durables: cars
- Large effect on cars suggests ESP provided down payment for debt-financed cars (alleviated liquidity constraints)
- Possible reversal for cars:
  - Did it move everyone forward a few months (no reversal)?
  - Or did those that didn’t buy immediately, spend it on something else and become liquidity constrained again (subsequent reversal)?
Parker (1999) and Souleles (1999) find that households respond to predictable changes in income

- Parker (1999): Households hitting SS tax limit
- Souleles (1999): Tax rebates
Parker (1999) and Souleles (1999) find that households respond to predictable changes in income

- Parker (1999): Households hitting SS tax limit
- Souleles (1999): Tax rebates

Interpretations:

1. Failure of “LC-PIH”
2. Too small and irregular for households to plan for
   (but why does that mean spend as opposed to save)
Parker (1999) and Souleles (1999) find that households respond to predictable changes in income

- Parker (1999): Households hitting SS tax limit
- Souleles (1999): Tax rebates

Interpretations:

1. Failure of “LC-PIH”
2. Too small and irregular for households to plan for
   (but why does that mean spend as opposed to save)

Browning and Collado (2001) study large predictable seasonal variation in earnings in Spain and find no response of consumption

- Studies consumption response to payments from Alaska’s Permanent Fund
- Payments are large and predictable

- Studies consumption response to payments from Alaska’s Permanent Fund
- Payments are large and predictable
- Finds no response of consumption to these payments
- In contrast, finds that Alaskan households are excessively sensitive to income tax rebates
Studies consumption response to payments from Alaska’s Permanent Fund

Payments are large and predictable

Finds no response of consumption to these payments

In contrast, finds that Alaskan household are excessively sensitive to income tax rebates

Concludes: Households will behave according to “LC-PIH” when it comes to large and regular payments
The Alaska Permanent Fund

- Created in 1976
- 25% of state government’s oil royalties go to fund
- Since 1982, about 50% of fund dividends distributed to Alaskan residents
The Alaska Permanent Fund

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- 25% of states government’s oil royalties go to fund
- Since 1982, about 50% of fund dividends distributed to Alaskan residents
- Subject to eligibility, every resident gets the same amount
  - Amount equal to $payment_t \times family_{size_t}$
- Over sample period, payments varied from low of $331 in 1984 to high of $1,964 in 2000
THE ALASKA PERMANENT FUND

- Created in 1976
- 25% of states government’s oil royalties go to fund
- Since 1982, about 50% of fund dividends distributed to Alaskan residents
- Subject to eligibility, every resident gets the same amount
  - Amount equal to $\text{payment}_t \times \text{familiysize}_h$
- Over sample period, payments varied from low of $331 in 1984 to high of $1,964 in 2000
- Good for testing “LC-PIH”:
  - Payments are large and predictable
  - Application in March. Dispersement in October. Amount set in September. But estimated by newspapers before that.
Data

- Main data source: Consumer expenditure survey
- Aggregates observations to household level
- Drops households in student housing, lacking family size, age of head of household, or food expenditures. Also drops movers.
- Total number of observations: about 800
ery three months. In the first and final interviews, the survey also collects additional data on the household’s demographic, income, and asset information. I extract and merge the data files to create one observation for each household covered by the survey. Since the Alaska Permanent Fund payout (per person) in year $t$ is the size of the Permanent Fund payout across different households. Using the differences in the size of the Permanent Fund dividend fund income is for observations from 1984 – 2000.

### Sample Statistics

#### Monthly consumption (July–September)

<table>
<thead>
<tr>
<th></th>
<th>Alaska</th>
<th>Other 49 states</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>Nondurable consumption</td>
<td>1,107</td>
<td>(998)</td>
</tr>
<tr>
<td>Food and alcohol</td>
<td>412</td>
<td>(221)</td>
</tr>
<tr>
<td>Apparel and services</td>
<td>109</td>
<td>(139)</td>
</tr>
<tr>
<td>Entertainment and personal care</td>
<td>161</td>
<td>(744)</td>
</tr>
<tr>
<td>Durable consumption</td>
<td>713</td>
<td>(1,178)</td>
</tr>
</tbody>
</table>

#### Monthly consumption (October–December)

<table>
<thead>
<tr>
<th></th>
<th>Alaska</th>
<th>Other 49 states</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>Nondurable consumption</td>
<td>1,109</td>
<td>(646)</td>
</tr>
<tr>
<td>Food and alcohol</td>
<td>396</td>
<td>(210)</td>
</tr>
<tr>
<td>Apparel and services</td>
<td>140</td>
<td>(186)</td>
</tr>
<tr>
<td>Entertainment and personal care</td>
<td>142</td>
<td>(208)</td>
</tr>
<tr>
<td>Durable consumption</td>
<td>643</td>
<td>(962)</td>
</tr>
<tr>
<td>Family size</td>
<td>2.7</td>
<td>(1.5)</td>
</tr>
<tr>
<td>Age</td>
<td>42.1</td>
<td>(13.3)</td>
</tr>
<tr>
<td>Pretax family income (monthly)</td>
<td>2,898</td>
<td>(2,341)</td>
</tr>
<tr>
<td>Alaska dividend fund income (per family)</td>
<td>2,048</td>
<td>(1,310)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>806</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** All nominal values were converted to 1982–1984 dollars. Alaska dividend fund income is for observations from 1984–2000.

**Excess Sensitivity Test**

\[
\log \left( \frac{C_{th}^{IV}}{C_{th}^{III}} \right) = \alpha_1 \frac{PFD_t \times familysize_h}{Familyincome_h} + z'_h \alpha_2 + \epsilon_{th}
\]

- \(C_{th}^{IV}\) is non-durable consumption of household \(h\) in quarter \(IV\)
- \(PFD_t\) is Permanent Fund payout per person in year \(t\)
- \(z_h\) contains constant, change in \# adults, \# children, 2nd order polynomial in age of household head
- \(\alpha_1\) measures elasticity of household consumption with respect to increase in income due to Permanent Fund payments
quarterly income, and $z$ contains variables for changes in the number of adults, number of children, and a second-order polynomial in age of the head of the household to capture the fact that household consumption is generally not flat over the life cycle. The amount of the payment received by each household is calculated as the product of PFD and family size. The main independent variable is the percentage increase in a household’s income in the fourth quarter due to payments from the Permanent Fund, and the key parameter of interest is $\beta_1$ which measures the elasticity of consumption to household income. The dependent variable is the change in household consumption (in logs) from the third quarter to the fourth quarter of the year. As previously mentioned, Alaskan residents received their dividend payments in the fourth quarter of the year. Under the certainty-equivalent version of the LC/PIH (or a version of the LC/PIH in which the expected variance of consumption is constant), $\beta_1$ should be equal to zero.

The first column in Table 2 presents the results of the first set of excess sensitivity tests for nondurable consumption. The point estimate of $\beta_1$ is positive, but economically and statistically insignificant; it indicates that a 10-percent increase in household income increases consumption by 0.002 percent. Since the dividend payments increased the quarterly income of the typical household in my sample by slightly more than 20 percent (see Table 1), the point estimate of the elasticity of nondurable consumption suggests that the Permanent Fund payments increased household consumption by 0.004 percent (roughly 4 cents) in the fourth quarter of the year.

The estimate in the basic specification in the first column is identified both by differences in the size of the payment across time and across families of different sizes. The second column in Table 2 controls for year effects and thus identifies the effect of the Permanent Fund only from the cross-sectional variation in family size. Although one should interpret these estimates with caution since there are clearly reasons to expect the seasonal pattern of consumption to differ between families of different sizes, the point estimate of the elasticity of consumption is still essentially zero. The specification in the third column controls for family size and thus only uses the variation across time in the amount of the payment to identify the consumption effects of the dividend payments. Once again, one should be cautious in interpreting these numbers, since the seasonal pattern of consumption may have changed over time. Nonetheless, the point estimate of the income elasticity of consumption is still economically and statistically insignificant.

The last three columns in Table 2 present estimates of the response of expenditures on durables to the Permanent Fund payments using the three excess sensitivity tests. The coefficients are small but marginally significant. Surprisingly, the point estimates indicate that

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$PFD_t \times Family Size_h$</td>
<td>0.0002</td>
<td>-0.0167</td>
<td>-0.0034</td>
<td>-0.1659</td>
<td>-0.1741</td>
<td>-0.1488</td>
</tr>
<tr>
<td>$Family Income_h$</td>
<td>(0.0324)</td>
<td>(0.0336)</td>
<td>(0.0328)</td>
<td>(0.0878)</td>
<td>(0.0916)</td>
<td>(0.0890)</td>
</tr>
<tr>
<td>Controls for:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Family size</td>
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<td>No</td>
<td>Yes</td>
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<tr>
<td>Year dummies</td>
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<td>Yes</td>
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</table>

Notes: Dependent variable is $\log(C_{IV}/C_{III})$. Standard errors are in parentheses. All regressions are ordinary least squares (OLS) and include a quadratic in age and changes in the number of children and adults in the household.

Baseline elasticity for non-durable consumption 0.0002 (s.e. 0.0324)
Typical shock 20%. Response 0.004 percent or 4 cents.
Baseline elasticity for non-durable consumption 0.0002 (s.e. 0.0324)

Typical shock 20%. Response 0.004 percent or 4 cents.

Baseline estimated from variation across years and across family size

Perhaps seasonal pattern is different for households of different size
- 3rd column controls for family size (only uses variation across time)
Table 2—Response of Consumption to Alaska PFD

<table>
<thead>
<tr>
<th></th>
<th>dlog(Nondurable consumption)</th>
<th>dlog(Durable consumption)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
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<tr>
<td>$PFD_t \times \text{Family Size}_h$</td>
<td>0.0002 (0.0324)</td>
<td>-0.0167 (0.0336)</td>
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<td>$\text{Family Income}_h$</td>
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<td>Controls for:</td>
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<td>Year dummies</td>
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<td>Number of observations</td>
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Notes: Dependent variable is $\log(C_{IV}/C_{III})$. Standard errors are in parentheses. All regressions are ordinary least squares (OLS) and include a quadratic in age and changes in the number of children and adults in the household.

Baseline elasticity for non-durable consumption 0.0002 (s.e. 0.0324)

Typical shock 20%. Response 0.004 percent or 4 cents.

Baseline estimated from variation across years and across family size

Perhaps seasonal pattern is different for households of different size
  3rd column controls for family size (only uses variation across time)

But perhaps seasonal pattern varied over time
  2nd column controls for time effects (only uses variation in family size)
Elasticity for durables negative and significant: -0.166 (0.088)

Suggests households purchase durables in 3rd quarter, before payments are made

This is consistent with theory, since this is when payment amount becomes known
What Do They Do With Money?

- CEX only asks about income and assets in 1st and 4th interview
- Not possible to see what each household does with payments
- But survey starting dates random throughout year
- Can construct estimates for representative Alaskan family
the change in expenditures on durables is smaller when the Permanent Fund payments are higher, which suggests that households purchase durables in the third quarter before the dividend payments are disbursed in October.

In sum, the estimates in Table 2 suggest that households either save their dividend income or use it to pay down debt. To corroborate this evidence, one would ideally also like to observe the debt and asset holdings of a family before and during the month of October. It is not possible to do this with the CEX since this survey does not collect asset and debt information in every interview (it only collects this information in the first and fourth interviews).

However, since the survey starting dates of a household are random throughout the year, this information can be used to construct estimates of the consumer debt and the balances in the savings and checking account of a representative Alaskan household in September and October. As can be seen in Figure 1, compared to a representative Alaskan family in September, a representative family in October had less consumer debt ($680) and higher balances in its savings and checking accounts ($440 and $640, respectively). In sum, the net assets of a typical family in the sample increased by $1,760 in October, which is slightly less than the amount an average family received from the Permanent Fund ($2,000; see Table 1).

As previously mentioned, the estimates shown in Table 2 are identified using differences in the seasonal pattern of consumption across time and across families of different sizes. It is possible that households do respond to the payments from the Permanent Fund, but the effect is masked by preexisting differences in the seasonal pattern of consumption across families of different sizes, or by changes in the seasonal pattern of consumption across time. The ideal way to address this possibility is to use households in other states whose seasonal pattern of consumption is similar to that of Alaskan households (in the absence of the Permanent Fund payments) as a control group. I do not have an ideal control group, but as partial suggestive evidence, I turn to graphical evidence on the seasonal pattern of consumption in Alaska compared with other households in the other 49 states.

\[ \text{Figure 1. Average Consumer Debt and Balances in Savings and Checking Accounts (Alaska Residents)} \]

Source: Hsieh (2003) – Credit down by $680, savings and checking up by $440 and $640, respectively. Average received from Fund: $2,000.
WHY ARE RESULTS SO DIFFERENT FROM PREVIOUS LITERATURE?

- Perhaps Alaskan households less liquidity constrained
  - But they are substantially younger ...
  - And results hold for those with low income
- Perhaps due to size and visibility of payments
- Check this by considering response to income tax receipts
  (as in Souleles 1999)
### Table 6—Response of Nondurable Consumption to Income Tax Refunds and PFD

<table>
<thead>
<tr>
<th></th>
<th>( \frac{d \log(\text{Nondurable consumption})}{\log(C_{II}/C_I)} )</th>
<th>( \frac{d \log(\text{Nondurable consumption})}{\log(C_{IV}/C_{III})} )</th>
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<td>( PFD_t \times \text{Family Size}_h )</td>
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**Notes:** Dependent variable is \( \frac{d \log(C_{II}/C_I)}{\log(C_{IV}/C_{III})} \) in the first column and \( \frac{d \log(C_{IV}/C_{III})}{\log(C_{II}/C_I)} \) in the second column. Standard errors are in parentheses. All regressions are OLS and include a quadratic in age and changes in the number of children and adults in the household.

Households display excess sensitivity to small, unpredictable, hard to predict changes in income

- Consistent with Parker (1999), Souleles (1999), Johnson-Parker-Souleles (2006), Parker et al. (2013)
Households display excess sensitivity to small, unpredictable, hard to predict changes in income

Consistent with Parker (1999), Souleles (1999), Johnson-Parker-Souleles (2006), Parker et al. (2013)

Households do not display excess sensitivity to large, predictable, highly visible changes in income

Consistent with Paxson (1992), Browning and Collado (2001)
Revisits Hsieh’s (2003) analysis and gets very different results
KUENG (2015)

Revisits Hsieh’s (2003) analysis and gets very different results
  • Normalizes dividend payments by total expenditure as opposed to current total family pre-tax income
    • This makes a big difference
    • Lots of measurement error in family income variable
    • Attenuation bias

Extends sample by 12 years and uses non-Alaskans as control group
  • Much more variation in dividend payments
  • Control group also improves precision
Revisits Hsieh’s (2003) analysis and gets very different results

- Normalizes dividend payments by total expenditure as opposed to current total family pre-tax income
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  - Lots of measurement error in family income variable
  - Attenuation bias
- Extends sample by 12 years and uses non-Alaskans as control group
  - Much more variation in dividend payments
  - Control group also improves precision
Figure 2 – Alaska Permanent Fund Dividend per person, 1982-2014 (nominal amount)

Source: Kueng (2015)
\[ \log c_{i,t} - \log c_{i,t-1} = \alpha_1 \frac{PFD_t \times \text{familysize}_i}{y_i} + \alpha_2' z_{i,t} + \epsilon_{i,t} \]

- \(y_i\) is either total expenditures or pre-tax total income
- \(z_{i,t}\) is a vector of controls that may include fixed effects
Figure 1 – Distribution of annual before-tax family income and total annualized expenditures

Source: Kueng (2015)
Table 2: Spending excess sensitivity tests using the Permanent Fund Dividend

<table>
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<th>Dep. var.: $\Delta \ln(c_{it})$, nondurables and services</th>
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<th>All households</th>
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<td>perm inc</td>
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</table>

**A: Sample 1980-2001**

|                                                          | (3)     | (4)     | (5)     | (6)     | (7)     | (8)     | (9)     |
| PFD x family size x Alaska / before-tax income | -0.003  | -0.003  | 0.052** | 0.009** | 0.091** | 0.107** |
|                                                          | (0.033) | (0.005) | (0.025) | (0.036) | (0.036) | (0.043) |
| PFD x family size x Alaska / total expenditures | 0.123   | 0.124   | 0.126   | 0.090** | 0.091** | 0.107** |
|                                                          | (0.086) | (0.112) | (0.127) | (0.036) | (0.036) | (0.043) |

Number of observations (rounded): 806 800 800 800 600 315200 315200 315200 281500
Number of Alaskan obs. (rounded): 806 800 800 800 600 4300 4300 4300 3800
Number of clusters (rounded): -- 0 800 800 600 117000 117000 117000 103400
Number of Alaskan CU's (rounded): 806 800 800 800 600 1700 1700 1700 1500
R-squared: 0.009 0.038 0.044 0.009 0.009 0.009 0.010
F-statistic for current and lagged dividend

**B: Sample 1980-2013**

|                                                          | (3)     | (4)     | (5)     | (6)     | (7)     | (8)     | (9)     |
| PFD x family size x Alaska / before-tax income | -0.001  | 0.011   | 0.076***| 0.007   | 0.007   | 0.136***|
|                                                          | (0.004) | (0.04)  | (0.023) | (0.027) | (0.027) | (0.032) |
| PFD x family size x Alaska / total expenditures | 0.116*  | 0.134*  | 0.125   | 0.113***| 0.113***| 0.136***|
|                                                          | (0.060) | (0.077) | (0.087) | (0.027) | (0.027) | (0.032) |

Number of observations (rounded): 1400 1400 1400 1000 559400 559400 559400 458000
Number of Alaskan obs. (rounded): 1400 1400 1400 1000 7100 7100 7100 5900
Number of clusters (rounded): 0 1400 1400 1000 206200 206200 206200 166000
Number of Alaskan CU's (rounded): 1400 1400 1400 1000 2800 2800 2800 2300
R-squared: 0.004 0.032 0.039 0.007 0.007 0.007 0.009
F-statistic for current and lagged dividend

- Other household characteristics: YES YES YES YES YES YES YES YES YES
- Family size: YES YES YES YES YES YES YES YES YES
- Period FEs: YES YES YES YES YES YES YES YES YES
- Alaska FE: YES YES YES YES YES YES YES YES YES
- Inverse total expenditures: YES YES YES YES YES YES YES YES YES

Notes: To maintain confidentiality, sample sizes in columns (2)-(10) are rounded to the nearest hundred. Columns (1)-(5) use only Alaskan households. For comparison, columns (3)-(4) use the same smaller sample as in columns (1)-(2) that excludes households with zero self-reported family income. Other household characteristics include quarterly changes in the number of children, adults, and seniors, and a quadratic in the age of the reference person. Robust standard errors in parentheses are clustered at the household level in columns (3)-(9), thereby adjusting for arbitrary within-household correlations and heteroskedasticity; OLS standard errors are used in columns (1) and (2).

Source: Kueng (2015)
Kueng (2015) – Main Results

- Normalizing by total expenditures dramatically changes results
- Results similar for extended sample (more significant without time FE)
Normalizing by total expenditures dramatically changes results
Results similar for extended sample (more significant without time FE)
Using non-Alaskans as a control group improves precision (Why?)
Normalizing by total expenditures dramatically changes results
Results similar for extended sample (more significant without time FE)
Using non-Alaskans as a control group improves precision (Why?)
Column 8 takes into account that on average only 83 cents per dollar of PFD is received in the form of cash income (some is garnished, also college fund, etc.)
Up until now:

- Excess sensitivity of consumption to predictable movements in income

Another type of potential excess sensitivity:

- Consumption seems to track income over the life-cycle
Less obviously, there may also be pure age effects. For example, if most people have a big celebration on the 50th birthday, then we should see a small “blip” in consumption at that age.

The fourth set of influences are cyclical effects. These are effects that are common to all agents in the same time period. The most obvious examples are movements in common variables like prices or interest rates. We also include other less well-defined general “shocks.” Although common, we must allow that the effects may differ across households and across cohorts. For example, an interest-rate shock has a different effect for indebted families than for wealthy ones.

The final feature of any micro data is the large heterogeneity evident in the level of consumption by families that are identical in all other observable characteristics. There is little we can do about this other than including a conventional error term to pick up some of this heterogeneity.

In this section we present some simple descriptions of our data and relate them to the influences described above. Our principal aim is to establish whether households smooth consumption in the face of an uneven income profile. Given that we do not observe the same households over time, we focus on average cohort data. We first assign households to six cohorts on the basis of the date of birth of the husband. Households are then assigned to either year-cells (for the analysis in this section) or to quarter-cells (for the analysis in Section III) on the basis of the date of the interview. The exact definition of the six cohorts considered is given in Table 1, along with the ages of the various cohorts in 1970 and 1986 and the mean, minimum, and maximum cell size of the quarter-cohort cells.

To begin our examination of the various influences on consumption, we return to the original 44,334 observations. For these data we regress log consumption and log real net income on 102 year-cohort dummies (there are six cohorts and 17 years) and three quarterly dummies. The year-cohort coefficients in this regression correspond to year-cohort means (with an adjustment to allow for seasonality).

Figure 1 shows the life-cycle paths of consumption and income. Each connected segment is the path over the 17 years of the survey for a particular cohort. In the graph we track part of the average consumption-age profile for each of the cohorts considered. The life-cycle paths given in Figure 1 are familiar: both consumption and income have an inverted U shape, and they are highly correlated. These results are consistent with those presented by Carroll and Summers (1991), who interpret them as evidence of lack of consumption-smoothing.

Figure 1, however, does not control for either family composition or labor-supply effects. To take into account the effect of demographic factors, we regress the year-cohort means plotted in Figure 1 on the year-cohort means of various demographic variables and plot the residuals of this regression in Figure 2.

Figure 1, Consumption and Income over the Life Cycle

Note: Connected solid, solid and dashed lines represent different cohorts.

Source: Attanasio and Browning (1995). Data are from the UK Family Expenditure Survey.
Life-Cycle Consumption Needs

- Consumption needs may vary over the life-cycle
- Most obvious source of such variation is family size and composition
- Attanasio and Browning (1995) regress cohort-year averages of consumption on cohort-year averages of:
  - Number of children
  - Number of adults
  - Log of family size
  - Dummy for at least one child

Then plot residual consumption
Unadjusted consumption

Adjusted consumption

Figure 2. Unadjusted and Adjusted Consumption over the Life Cycle

Note: Connected solid, solid and dashed lines represent different cohorts.

Source: Attanasio and Browning (1995). Data are from the UK Family Expenditure Survey.
Gourinchas and Parker (2002) perform a similar exercise on U.S. data from the Consumer Expenditure Survey. They control for a set of dummy variables for family size. They find that even controlling for this consumption tracks income over the life cycle. I have tried to replicate this analysis and I found that consumption tracks income (if anything) even more over the life-cycle.
CONSUMPTION OVER THE LIFE CYCLE

Thousands of 1987 dollars

Consumption (smoothed)
Consumption (raw)
Income

FIGURE 2. Household consumption and income over the life cycle.

Source: Gourinchas-Parker (2002). Takes out cohort and time effects.
Family size held constant over life-cycle.
PIH/LCH predicts that fast growing countries should have very different age-consumption profiles at a point in time than slow growing countries. (How should they differ?)
PIH/LCH predicts that fast growing countries should have very different age-consumption profiles at a point in time than slow growing countries. (How should they differ?)

- In a fast growing country, young have much higher life-time resources than old
- In a slow growing country, less so.
- Age-consumption profile should be more downward sloping in fast growing countries than slow growing
  (Relies imperfect sharing of income across generations within families)
Fig. 10.4 Theoretical and empirical age-consumption cross-section profiles in countries with differing rates of income growth

Source: (a) Theoretical calculations described in the text, (b) empirical calculations described in the data appendix.


Point in time consumption profile.
Consumption Growth Parallels Income Growth

Fig. 10.4 Theoretical and empirical age-consumption cross-section profiles in countries with differing rates of income growth

Source: (a) Theoretical calculations described in the text, (b) empirical calculations described in the data appendix.

Growth in per capita GNP from 1960-1985:
- Japan: 5.2%
- U.S.: 2.1%

Yet Japan has a steeper consumption profile than US!!

What about family transfers?
Perhaps there is some common cause of income growth and consumption growth across countries.

But what if we look across education groups or occupations within a country?

Education groups and occupations with steeper income profiles should borrow more early in life according to PIH/LCH.
Some Grade School

Some High School

Finished High School

Some College

Finished College

Source: Carroll and Summers (1991). Data from the US CES.
Consumption Growth Parallels Income Growth

Craftsmen operators professionals

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Income and consumption profiles by occupational group, 1960-61

Source: Calculations by authors using CES tapes.

The consumer will therefore be observed consuming more during those periods of life when he works most and earns the most income. To be more specific, this model would suggest that busy executives late in life would be more likely to have a maid to do housekeeping chores and more likely to send out their laundry than young people with (presumably) more time on their hands.

Source: Carroll and Summers (1991). Data from the US CES.
Figure 2.—Household consumption and income over the life cycle.

Source: Gourinchas-Parker (2002). Takes out cohort and time effects.
Family size held constant over life-cycle.