Explaining Consumption Excess Sensitivity with Near-Rationality:
Evidence from Large Predetermined Payments

LORENZ KUENG

Northwestern University and NBER
Motivation:

- understanding consumption is important
  - consumption is about 2/3 of GDP in developed countries
  - effectiveness of stabilization policies depends on consumption response to often predictable cash flows

- standard model (PILCH) has two main predictions for consumption:
  1. *should* respond to news
  2. *should not* respond to timing of cash flows; i.e., predetermined income (*excess sensitivity*)

- previously I focused on the first prediction, now I turn to the second
Preview:

▶ use new transaction data from user accounts at large personal finance website

▶ combine with quasi-experiments from annual Alaska Permanent Fund Dividend (PFD)
  ▶ salient (large news coverage and own website)
  ▶ predetermined (known 1 month before; size based on past)
  ▶ large payments every Oct to each Alaskan ($2,072 in 2015)

▶ payment properties and data sample favor standard model
  ▶ yet, I find a large response to the PFD:
    ▶ using both non-parametric and parametric methods
    ▶ nondurables MPC of 30%

▶ the new data and the properties of the PFD rule out most previous explanations of excess sensitivity
derive **potential loss** in wealth from fully consuming PFD instead of fully smoothing

\[
\text{Loss} \propto \frac{PFD}{cT}
\]

- \(\frac{PFD}{cT}\) is the relative size of the payment normalized by consumption (permanent income)
- can be calculated *ex-ante* to predict excess sensitivity

- potential loss **predicts heterogeneity** in MPCs
  - MPCs are steeply *decreasing* across loss quintiles

- maybe surprisingly, this is consistent with high-income households having *larger* MPCs
  - indeed, MPCs are strongly *increasing* in income
welfare losses fully explain heterogeneity in MPCs among unconstrained hh: *ex-post losses* are the same across hh and small

⇒ these are *near-rational deviations*
welfare losses fully explain heterogeneity in MPCs among unconstrained hh: *ex-post losses* are the same across hh and small

⇒ these are near-rational deviations

**Conclusion**

1. **Near-rational deviations** from standard model predict heterogeneity in MPCs in the cross section
   - for higher-income households, who have sufficient liquid wealth
   - estimated using a single source of predetermined income within the same research design

2. Show **borrowing constraints** continue to predict high MPCs
   - for lower-income households with few liquid assets

⇒ this is a *new* explanation for a different population segment
Previous explanations of excess sensitivity:

- **borrowing constraints**
  - majority of sample has large amounts of *liquid* assets
    - not wealthy hand-to-mouth consumers

- **precautionary saving**
  - no uncertainty in the month of the dividend payments
  - low uncertainty of dividend in all other months
  - most households have lots of liquid wealth

- **rational inattention, cons. commitments, optimization frictions**
  - should only respond to new information since last update
  - reasonable forecast errors are positive and negative
  - news component is very small
  - instead, households respond to *entire* dividend

- **non-separable preferences**
  - dividend is independent of future labor income growth
  - response across all categories, including strictly nondurables
Outline:

1. quasi-experiment and data

2. average excess sensitivity
   ▶ nonparametric evidence
   ▶ parametric estimate of MPC

3. near-rationality and higher-income hh MPCs

4. liquidity constraints and lower-income hh MPCs

5. external validity using the Consumer Expenditure Survey

6. robustness
   ▶ consumption vs. spending
   ▶ specification checks

7. extensions
   ▶ durables and total expenditure MPCs
   ▶ anticipation effects
   ▶ consumption commitments
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Alaska Permanent Fund Dividend:

Annual payment from state’s broadly-diversified wealth fund

**Important characteristics of PFD** for excess sensitivity tests:

1. *salient, predetermined, and regular*
   - 5-year moving average of fund’s income:
     - highly predictable
     - payment size is orthogonal to local economy
   - based on June numbers, announced in Sept., paid in October
   - well covered by local media during the year

2. *nominally large*
   - latest dividend: $2,072 in October 2015
   - for each Alaskan, including children (avg family size = 2.7)

3. *lump-sum*
   - more important for low-income households and large families
   ⇒ cross-sectional heterogeneity in the importance of the PFD
Historical Dividend Distributions

- Permanent Fund Dividend (PFD)
- PFD, including one-time resource rebate

Sample period used in Hsieh (2003)
Salience: Expected divided based on narrative analysis of local newspapers
Salience: Alaska Permanent Fund’s website
Salience: Expected divided based on Permanent Fund’s financial statements
Household Spending Data:

1. New transaction data from user accounts at a large **personal finance website** (PFW) from 2010-2014
   - linked credit card and financial accounts
   - 1,400 Alaskan users that receive dividend via direct deposit (treatment group)
   - 2,200 users from state of Washington as control group
   - high-quality data on income, detailed expenditures, and financial assets

2. **Consumer Expenditure Survey** (CE) to check external validity of new data and results
   - neither dataset is representative of Alaskan population
   - PFW over-represents higher-income households
   - CE over-represents lower-income households
Outline:

1. data and quasi-experiment ✓

2. **average excess sensitivity**
   - nonparametric evidence
   - parametric estimate of MPC

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   - durables and total expenditure MPCs
   - anticipation effects
   - consumption commitments
Nonparametric Evidence: Average nondurable spending changes per person by month in Alaska vs. Washington
Parametric Evidence: Testing for anticipation effects

\[ c_{i,t} - c_{i,t-1} = \sum_s \beta_s \cdot PFD_{i,t-s} + \tau_t + \text{Alaska}_i + \epsilon_{i,t} \]
**Parametric Evidence:** Testing for anticipation effects

\[ c_{i,t} - c_{i,t-1} = \sum_{s} \beta_s \cdot PFD_{i,t-s} + \tau_t + \text{Alaska}_i + \epsilon_{i,t} \]
Parametric Evidence: Cumulative MPC = \( \sum_s MPC(s) \)
Outline:

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Approximate Loss from Potential Near-Rational Deviations:

Standard, frictionless life-cycle model’s optimal consumption plan

\[
c^*_w = \arg \max_c \left\{ U(c) = \sum_t \delta^t u(c_t) : p'c \leq w \right\}
\]

To derive money-metric proportional wealth loss

- 2nd-order approx. of utility around optimum, \( U(c^*_w) \), and evaluating at deviation \( \tilde{c}_w \) that satisfies budget constraint, \( p'\tilde{c}_w = w \)

- 1st-order approx. of \( U(c^*_w) \) in wealth \( \tilde{w} \), and setting \( U(c^*_\tilde{w}) = U(\tilde{c}_w) \)

\[
Loss(\tilde{c}, c^*) \equiv -\frac{\tilde{w} - w}{w} \approx \frac{\gamma}{2} \sum_t \omega^*_t \left( \frac{\tilde{c}_t - c^*_t}{c^*_t} \right)^2
\]

with utility annuity weights \( \omega^*_t = \frac{\delta^t u(c^*_t)}{U(c^*)} \) and CES sub-utility \( u(c) = \frac{c^{1-\gamma}}{1-\gamma} \)
To apply loss statistic to PFD setting, we need to specify the potential alternative consumption plan $\tilde{c}$

1. no discounting:
   \[ \delta = r = 0 \Rightarrow c^*_t = c^* \]

2. spend PFD fully when paid, independent of dividend size

3. divide finite horizon in equal intervals with $T$ periods between news and payments

\[ \Rightarrow \text{Loss}(\tilde{c}, c^*) \approx \left( \frac{\text{PFD}}{c_T} \right)^2 \cdot (T - 1) \cdot \frac{\gamma}{2} \]

with $c_T = T \cdot c^*$
MPC heterogeneity: by potential loss \( (PFD/c_T) \)

Average rel. dividend size per quintile: \( PFD/c_T \) = 1.60\%, 2.7\%, 3.7\%, 5.4\%, 10.3\%

Assuming \( T=4 \) quarters and \( \gamma = 2 \): Potential loss (ex-ante) = 0.08\%, 0.2\%, 0.4\%, 0.9\%, 3.2\%
MPC heterogeneity: by potential loss \((PFD/c_T)\)

- Average rel. dividend size per quintile: \(PFD/c_T\) = 1.60%, 2.7%, 3.7%, 5.4%, 10.3%
- Assuming \(T=4\) quarters and \(\gamma = 2\): Potential loss (ex-ante) = 0.08%, 0.2%, 0.4%, 0.9%, 3.2%
  Actual ex-post loss = 0.05%, 0.08%, 0.07%, 0.06%, 0.07%
**MPC heterogeneity:** by income per person (equivalent scale)

Average income per quintile: 16k, 30k, 42k, 58k, 104k

Table 2 in the paper shows similar results when conditioning on shock size (and vice versa), liquid assets and hh characteristics.
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   ▶ parametric estimate of MPC

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**Liquidity Constraints:**

- households in top two quintiles are unconstrained (avg. bank balances of $55k and $84k)
- low MPCs in bottom two income quintiles might suggest that credit constraints do not explain MPCs

Hence, I **focus on the sample of lower-income households** (below median hh income of $75k)

- still sizable liquid assets, but also lots of variation:
  - average bank balances of $17k
  - standard deviation of $7k

- form **three bins**:
  1. households with no or few liquidity ($<$100)
  2. households with 1-3×PFD : potential prec. savings motives
  3. households with more than 3×PFD in bank accounts
MPC heterogeneity: by liquid assets  (total bank balances)

- Potential wealth losses predict MPCs for HHs with sufficient liquid assets.
- Low liquid assets continue to predict high MPCs.
**MPC heterogeneity:** by liquid assets (total bank balances)

![Graph showing MPC heterogeneity by liquid assets](image)

**Conclusion:**

1. potential wealth losses predict MPCs for HHs with sufficient liquid assets
2. low liquid assets continue to predict high MPCs
Outline:

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**External validity** implementing same analysis using the CE

Obtain similar results after taking into account

1. fraction of Alaskans that do not receive dividend

2. different sample composition
   - average Alaskan family income in CE is lower ($63k vs $94k)
   - important since MPC is increasing in income
**External validity** implementing same analysis using the CE

**Obtain similar results** after taking into account

1. fraction of Alaskans that do not receive dividend
2. different sample composition
   - average Alaskan family income in CE is lower ($63k vs $94k)
   - important since MPC is increasing in income

### Panel B: Robustness and CE

<table>
<thead>
<tr>
<th></th>
<th>CE</th>
<th>PFD imputation</th>
<th>sample composition</th>
<th>IV</th>
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<tbody>
<tr>
<td>imputed PFD payments in CE</td>
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<td>0.079**</td>
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<td></td>
<td></td>
<td>(0.036)</td>
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<tr>
<td>PFD x family size</td>
<td></td>
<td>0.190***</td>
<td>-0.021</td>
<td>0.264***</td>
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<td></td>
<td></td>
<td>(0.030)</td>
<td>(0.048)</td>
<td>(0.040)</td>
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<tr>
<td>PFD x family size x income/$100,000</td>
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<tr>
<td></td>
<td></td>
<td>0.187***</td>
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<td>(0.044)</td>
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</table>

**predicted MPC using average CE income**

- Alaska FE YES YES YES YES
- Period FEs YES YES YES YES
- Observations 385,800 46,807 46,807 46,807
- R-squared 0.006 0.107 0.108 0.106
Conclusion

Main findings

▶ substantial response even to large payments
▶ near-rationality helps predict response heterogeneity, especially for higher-income hh (unconstrained)
▶ *actual ex-ante losses* are similar and *small*, consistent with near-rational behavior (*<* 1 day consumption equivalent)
▶ low liquid assets continue to predict high responses, too

Policy implications
Conclusion

Main findings

▶ substantial response even to large payments
▶ near-rationality helps predict response heterogeneity, especially for higher-income hh (unconstrained)
▶ *actual ex-ante losses* are similar and *small*, consistent with near-rational behavior (< 1 day consumption equivalent)
▶ low liquid assets continue to predict high responses, too

Policy implications

▶ results are important for macro policies, since most stabilizers (discretionary and automatic) have similar or lower sizes
▶ targeting low-income low-asset HHs might not be the only or best stimulus program
▶ modeling of near-rational consumption behavior is important next step, i.e., why higher-income hh spend dividend
Appendix
**Consumption vs Spending**: Spending across different categories

<table>
<thead>
<tr>
<th></th>
<th>all</th>
<th>groceries</th>
<th>personal care</th>
<th>kids activities</th>
<th>gasoline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Spending across goods</strong></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>PFD payments</td>
<td>0.075*** (0.014)</td>
<td>0.058*** (0.011)</td>
<td>0.007*** (0.002)</td>
<td>0.005*** (0.001)</td>
<td>0.020*** (0.005)</td>
</tr>
<tr>
<td>- Alaska FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>- Period FEs</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>Observations</td>
<td>46,807</td>
<td>46,807</td>
<td>46,807</td>
<td>46,807</td>
<td>46,807</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.140</td>
<td>0.109</td>
<td>0.013</td>
<td>0.011</td>
<td>0.060</td>
</tr>
</tbody>
</table>

- Alaska FE:
- Period FEs:

*Note:* Significant levels marked as: ***p < 0.01, **p < 0.05, *p < 0.10.
## Specification checks

### Panel B: Robustness

<table>
<thead>
<tr>
<th></th>
<th>median</th>
<th>family size</th>
<th>hh charact.</th>
<th>Alaskans only</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PFD payments</strong></td>
<td>0.265***</td>
<td>0.282***</td>
<td>0.286***</td>
<td>0.284***</td>
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<td></td>
<td>(0.032)</td>
<td>(0.043)</td>
<td>(0.044)</td>
<td>(0.051)</td>
</tr>
<tr>
<td>- Alaska FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>- Period FEs</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>- Family size</td>
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<td>YES</td>
<td>YES</td>
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</tr>
<tr>
<td>- Other household characteristics</td>
<td>--</td>
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<tr>
<td><strong>Observations</strong></td>
<td>46,807</td>
<td>46,807</td>
<td>46,807</td>
<td>17,899</td>
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<tr>
<td><strong>R-squared</strong></td>
<td>0.068</td>
<td>0.107</td>
<td>0.109</td>
<td>0.117</td>
</tr>
</tbody>
</table>
# MPC Heterogeneity by relative dividend size and income

## Table 2: Heterogeneity of MPCs

<table>
<thead>
<tr>
<th>Dep. var.: $\Delta c_{it}$, quarterly nondurables and services</th>
<th>average MPC</th>
<th>by shock size</th>
<th>by income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>PFD payments</td>
<td>0.297***</td>
<td>0.490***</td>
<td>0.744***</td>
</tr>
<tr>
<td></td>
<td>(0.044)</td>
<td>(0.078)</td>
<td>(0.113)</td>
</tr>
<tr>
<td>PFD x shock size</td>
<td>-2.875***</td>
<td>-0.152***</td>
<td>-0.014</td>
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<tr>
<td></td>
<td>(0.775)</td>
<td>(0.032)</td>
<td>(0.196)</td>
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<tr>
<td>PFD x shock size quintile</td>
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<tr>
<td>squared PFD/100</td>
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<tr>
<td>PFD x income / $100,000</td>
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<td>- Income</td>
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<td>- Liquid assets</td>
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<tr>
<td>- Household characteristics</td>
<td>YES</td>
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</tr>
</tbody>
</table>
MPC Heterogeneity: relative dividend explains heterogeneity, not the squared dividend

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<tr>
<td></td>
<td>linear (2)</td>
<td>quintile (3)</td>
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<td>linear (5)</td>
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Smaller Durables. Testing for anticipation effects

\[ c_{i,t} - c_{i,t-1} = \sum_s \beta_s \cdot PFD_{i,t-s} + \tau_t + \text{Alaska}_i + \epsilon_{i,t} \]
Smaller Durables. Cumulative MPC = $\sum_s MPC(s)$
Smaller Durables and **Total Expenditures**

### Panel A: Spending across goods

<table>
<thead>
<tr>
<th></th>
<th>smaller durables</th>
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<tbody>
<tr>
<td></td>
<td>cc txns</td>
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<tr>
<td>PFD payments</td>
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<td>0.123***</td>
<td>0.185***</td>
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<td>(0.028)</td>
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- Alaska FE
- Period FEs

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<tbody>
<tr>
<td>Observations</td>
<td>46,807</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.060</td>
</tr>
</tbody>
</table>
**Hsieh’s specification**: Normalization of dividend by family income (current income) vs total expenditures (permanent income) in the CE matters.

<table>
<thead>
<tr>
<th>Dep. var.: $\Delta \ln(c_{it})$, nondurables and services</th>
<th>Hsieh’s specification</th>
<th>All households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hsieh (2003) replication and extension</td>
<td>normalize w/ total expend.</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

A: Sample 1980-2001

<table>
<thead>
<tr>
<th>PFD x family size x Alaska / before-tax income</th>
<th>0.003 (0.033)</th>
<th>-0.003 (0.005)</th>
<th>0.123 (0.086)</th>
<th>0.090** (0.036)</th>
<th>0.107** (0.043)</th>
<th>0.052** (0.025)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFD x family size x Alaska / total expenditures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Other household characteristics</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>- Family size</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>- Period FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>- Alaska FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>- Inverse total expenditures</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

Number of observations (rounded) | 806 | 800 | 800 | 315200 | 315200 | 281500 |
Number of Alaskan CUs (rounded) | 806 | 800 | 800 | 1700 | 1700 | 1500 |
R-squared | N/A | 0.009 | 0.013 | 0.009 | 0.009 | 0.010 |
Hsieh’s specification: Extending CE sample to 2013.

Dep. var.: $\Delta \ln(c_{it})$, nondurables and services

<table>
<thead>
<tr>
<th></th>
<th>Alaskans only</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>replication</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>normalize w/</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>total expend.</td>
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<tr>
<td></td>
<td>using rest of</td>
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<td></td>
<td>U.S. as control</td>
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<tr>
<td></td>
<td>attenuation</td>
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<td>factor</td>
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<td></td>
<td>IV curr inc w/</td>
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</tr>
<tr>
<td></td>
<td>perm inc</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B: Sample 1980-2013

PFD x family size x Alaska / before-tax income

- $-0.001$ (0.004)

PFD x family size x Alaska / total expenditures

- $0.116^*$ (0.060)
- $0.113^{***}$ (0.027)
- $0.136^{***}$ (0.032)

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

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of observations (rounded)</td>
<td>1400</td>
<td>1400</td>
<td>559400</td>
<td>559400</td>
<td>458000</td>
<td></td>
</tr>
<tr>
<td>Number of Alaskan CUs (rounded)</td>
<td>1400</td>
<td>1400</td>
<td>2800</td>
<td>2800</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.004</td>
<td>0.007</td>
<td>0.007</td>
<td>0.007</td>
<td>0.009</td>
<td></td>
</tr>
</tbody>
</table>
**Hsieh’s specification:** Measurement error in current income, and comparison to permanent income (total expenditures).