Econ 219B
Psychology and Economics: Applications (Lecture 14 and last)

Stefano DellaVigna

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Outline

1. Market Reaction to Biases: Behavioral Finance

2. Welfare Response to Biases

3. Concluding Remarks

4. Teaching Evaluation
1 Market Reaction to Biases: Behavioral Finance

- Who do ‘smart’ investors respond to investors with biases?

- First, brief overview of anomalies in Asset Pricing (from Barberis and Thaler, 2004)

  1. Underdiversification.

     (a) Too few companies.

        – Investors hold an average of 4-6 stocks in portfolio.

        – Improvement with mutual funds

     (b) Too few countries.

       – Investors heavily invested in own country.

       – Own country equity: 94% (US), 98% (Japan), 82% (UK)
- Own area: own local Bells (Huberman, 2001)

(c) Own company
- In companies offering own stock in 401(k) plan, substantial investment in employer stock

2. **Naive diversification.**
- Investors tend to distribute wealth ‘equally’ among alternatives in 401(k) plan (Benartzi and Thaler, 2001; Huberman and Jiang, 2005)

3. **Excessive Trading.**
- Trade too much given transaction costs (Odean, 2001)
4. **Disposition Effect in selling**
   - Investors more likely to sell winners than losers

5. **Attention Effects in buying**
   - Stocks with extreme price or volume movements attract attention (Odean, 2003)

• Should market forces and arbitrage eliminate these phenomena?
• **Arbitrage:**
  – Individuals attempt to maximize individual wealth
  – They take advantage of opportunities for free lunches

• Implications of arbitrage: ‘Strange’ preferences do not affect pricing

• Implication: For prices of assets, no need to worry about behavioral stories

• Is it true?
• Fictitious example:
  – Asset A returns $1 tomorrow with $p = .5$
  – Asset B returns $1$ tomorrow with $p = .5$

  – Arbitrage $\Rightarrow$ Price of A has to equal price of B
  – If $p_A > p_B$,
    * sell A and buy B
    * keep selling and buying until $p_A = p_B$
  – Viceversa if $p_A < p_B
• Problem: Arbitrage is limited (de Long et al., 1991; Shleifer, 2001)

• In Example: can buy/sell A or B and tomorrow get fundamental value

• In Real world: prices can diverge from fundamental value

• Real world example. Royal Dutch and Shell
  – Companies merged financially in 1907
  – Royal Dutch shares: claim to 60% of total cash flow
  – Shell shares: claim to 40% of total cash flow
  – Shares are nothing but claims to cash flow
Price of Royal Dutch should be $60/40 = 3/2$ price of Shell

- $p_{RD}/p_{S}$ differs substantially from 1.5 (Fig. 1)
• Plenty of other example (Palm/3Com)

• What is the problem?
  
  – Noise trader risk, investors with correlated valuations that diverge from fundamental value
  
  – (Example: Naive Investors keep persistently bidding down price of Shell)
  
  – In the long run, convergence to cash-flow value
  
  – In the short-run, divergence can even increase
  
  – (Example: Price of Shell may be bid down even more)
● **Noise Traders**

● DeLong, Shleifer, Summers, Waldman (*JPE* 1990)


● Fundamental question: What happens to prices if:
  – (Limited) arbitrage
  – Some irrational investors with correlated (wrong) beliefs

● First paper on Market Reaction to Biases

● *The* key paper in Behavioral Finance
The model assumptions

A1: arbitrageurs risk averse and short horizon

→ Justification?

* Short-selling constraints

  (per-period fee if borrowing cash/securities)

* Evaluation of Fund managers.

* Principal-Agent problem for fund managers.
A2: noise traders (Kyle 1985; Black 1986)

misperceive future expected price at $t$ by

$$\rho_t \overset{i.i.d.}{\sim} \mathcal{N}(\rho^*, \sigma^2_\rho)$$

misperception correlated across noise traders ($\rho^* \neq 0$)

$\longrightarrow$ Justification?

* fads and bubbles (Internet stocks, biotechs)

* pseudo-signals (advice broker, financial guru)

* behavioral biases / misperception riskiness
What else?

• $\mu$ noise traders, $(1 - \mu)$ arbitrageurs

• OLG model
  – Period 1: initial endowment, trade
  – Period 2: consumption

• Two assets with identical dividend $r$
  – safe asset: perfectly elastic supply
    $\implies$ price $= 1$ (numeraire)
  – unsafe asset: inelastic supply (1 unit)
    $\implies$ price?

• Demand for unsafe asset: $\lambda^a$ and $\lambda^n$, with $\lambda^n \mu + \lambda^a (1 - \mu) = 1$.

• CARA: $U(w) = -e^{-2\gamma w}$ ($w$ wealth when old)
\[ E[U(w)] = \int_{\infty}^{\infty} -e^{-2\gamma w} \cdot \frac{1}{\sqrt{2\pi\sigma_w^2}} \cdot e^{-\frac{1}{2\sigma_w^2}(w-\bar{w})^2} \, dw \]

\[ = -\int_{\infty}^{\infty} \frac{1}{\sqrt{2\pi\sigma_w^2}} \cdot e^{-\frac{4\gamma w\sigma_w^2 + w^2 + \bar{w}^2 - 2w\bar{w}}{2\sigma_w^2}} \, dw \]

\[ = -\int_{\infty}^{\infty} \frac{1}{\sqrt{2\pi\sigma_w^2}} \cdot e^{-\frac{(w-[2\gamma\sigma_w^2 + \bar{w}])^2 + \bar{w}^2 - 4\gamma^2\sigma_w^4 - w^2 - 2\gamma\sigma_w^2\bar{w}}{2\sigma_w^2}} \, dw \]

\[ = -e^{\frac{4\gamma^2\sigma_w^2 + 2\gamma\sigma_w^2\bar{w}}{2\sigma_w^2}} \int_{\infty}^{\infty} \frac{1}{\sqrt{2\pi\sigma_w^2}} \cdot e^{-\frac{(w-[2\gamma\sigma_w^2 + \bar{w}])^2}{2\sigma_w^2}} \, dw \]

\[ = -e^{4\gamma^2\sigma_w^2 + 2\gamma\bar{w}} = e^{-2\gamma(\bar{w} - \gamma\sigma_w^2)} \]

\[ \max E[U(w)] \quad \max \bar{w} - \gamma\sigma_w^2 \]

\[ \text{pos. mon. transf.} \]
Arbitrageurs:

$$\max (w_t - \lambda_t^a p_t)(1 + r)$$

$$+ \lambda_t^a (E_t[p_{t+1}] + r)$$

$$- \gamma (\lambda_t^a)^2 Var_t(p_{t+1})$$

Noise traders:

$$\max (w_t - \lambda_t^n p_t)(1 + r)$$

$$+ \lambda_t^n (E_t[p_{t+1}] + \rho_t + r)$$

$$- \gamma (\lambda_t^n)^2 Var_t(p_{t+1})$$

(Note: Noise traders know how to factor the effect of future price volatility into their calculations of values.)
Arbitrageurs: \( \frac{\partial E[U]}{\partial \lambda_t^a} \equiv 0 \)

\[
\lambda_t^a = \frac{r + E_t[p_{t+1}] - (1 + r)p_t}{2\gamma \cdot Var_t(p_{t+1})}
\]

Noise traders: \( \frac{\partial E[U]}{\partial \lambda_t^n} \equiv 0 \)

\[
\lambda_t^n = \frac{r + E_t[p_{t+1}] - (1 + r)p_t}{2\gamma \cdot Var_t(p_{t+1})} + \frac{\rho_t}{2\gamma \cdot Var_t(p_{t+1})}
\]
Interpretation

• Demand for unsafe asset function of:
  – (+) expected return \( r + E_t[p_{t+1}] - (1 + r)p_t \)
  – (-) risk aversion (\( \gamma \))
  – (-) variance of return \( (Var_t(p_{t+1})) \)
  – (+) overestimation of return \( \rho_t \) (noise traders)

• Notice: noise traders hold more risky asset than arb. if \( \rho > 0 \) (and viceversa)

• Notice: Variance of prices come from noise trader risk. “Price when old” depends on uncertain belief of next periods’ noise traders.
• Impose general equilibrium: $\lambda^n \mu + \lambda^a (1 - \mu) = 1$ to obtain

$$1 = \frac{r + E_t[p_{t+1}] - (1 + r) p_t}{2 \gamma \cdot Var_t(p_{t+1})} + \frac{\rho_t}{2 \gamma \cdot Var_t(p_{t+1})} \quad \text{or}$$

$$p_t = \frac{1}{1 + r} \left[ r + E_t[p_{t+1}] - 2 \gamma \cdot Var_t(p_{t+1}) + \mu \rho_t \right]$$

• To solve for $p_t$, we need to solve for $E_t[p_{t+1}] = E[p]$ and $Var_t(p_{t+1})$

$$E[p] = \frac{1}{1 + r} \left[ r + E_t[p] - 2 \gamma \cdot Var_t(p_{t+1}) + \mu E[\rho_t] \right]$$

$$E[p] = 1 + \frac{-2 \gamma \cdot Var_t(p_{t+1}) + \mu \rho^*}{r}$$
Rewrite $p_t$ plugging in

$$p_t = 1 - \frac{2\gamma \cdot Var_t(p_{t+1})}{r} + \frac{\mu \rho^*}{r(1+r)} + \frac{\mu \rho_t}{1+r}$$

$$Var[p_t] = Var \left[ \frac{\mu \rho_t}{1+r} \right] = \frac{\mu^2}{(1+r)^2} Var(\rho_t) = \frac{\mu^2}{(1+r)^2} \sigma^2_{\rho}$$

Rewrite $p_t$

$$p_t = 1 + \frac{\mu \rho^*}{r} + \frac{\mu (\rho_t - \rho^*)}{1+r} - 2\frac{\gamma \mu^2 \sigma^2_{\rho}}{r(1+r)^2}$$

Noise traders affect prices!

Term 1: Variation in noise trader (mis-)perception

Term 2: Average misperception of noise traders

Term 3: Compensation for noise trader risk
• Relative returns of noise traders

  – Compare returns to noise traders $R^n$ to returns for arbitrageurs $R_a$:

  \[
  \Delta R = R^n - R^a = (\lambda_t^n - \lambda_t^a) [r + p_{t+1} - p_t (1 + r)]
  \]

  \[
  E(\Delta R|\rho_t) = \rho_t - \frac{(1 + r)^2 \rho_t^2}{2\gamma\mu\sigma^2_{\rho}}
  \]

  \[
  E(\Delta R) = \rho^* - \frac{(1 + r)^2 (\rho^*)^2 + (1 + r)^2 \sigma^2_{\rho}}{2\gamma\mu\sigma^2_{\rho}}
  \]

  – Noise traders hold more risky asset if $\rho^* > 0$

  – Return of noise traders can be higher if $\rho^* > 0$ (and not too positive)

  – Noise traders therefore may outperform arbitrageurs if optimistic!

  – (Reason is that they are taking more risk)
Welfare

- Sophisticated investors have higher utility
- Noise traders have lower utility than they expect
- Noise traders may have higher returns (if $\rho^* > 0$)
- Noise traders do not necessarily disappear over time
• Three fundamental assumptions
  1. OLG: no last period; short horizon
  2. Fixed supply unsafe asset \((a \text{ cannot convert safe into unsafe})\)
  3. Noise trader risk systematic

• Noise trader models imply that biases affect asset prices:
  – Reference Dependence
  – Attention
  – Persuasion
2 Welfare Response to Biases

- Room for government/social planner intervention?
  - No if:
    * Sophistication about biases
    * Markets to correct biases exist
  - No if:
    * Naivete’ of agents
    * Missing markets
    * Example: sin taxes on goods

- Government intervention does not need to be heavy-handed:
  - Require active decision
  - Change default
• **Benartzi-Thaler, 2004** (First behavioral paper in JPE since 1991!)

• Setting:
  – Midsize manufacturing company
  – 1998 onward
  – Company constrained by anti-discrimination rules —> Interested in increasing savings

• Features of SMT 401(k) plan:
  – No current increase in contribution rate
  – Increase in contribution rate by 3% per future pay increase
  – Can quit plan at any time
• Biases targeted:

1. Self-control
   - Desire to Save more
   - Demand for commitment

2. Partial naïveté’
   - Partial Sophistication $\rightarrow$ Demand of commitment
   - Partial Naïveté $\rightarrow$ Procrastination in quitting plan

3. Loss Aversion with respect to nominal wage cuts
   - Hate real wage cuts
   - Accept nominal wage cuts
• Solutions:
  1. Increase savings in the future (not in present)
  2. Set default so that procrastination leads to **more** (not less) savings
  3. Schedule increase only at time of pay raise

• Implementation:

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Participation Data for the First Implementation of SMART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of plan participants prior to the adoption of the SMART plan</td>
<td>315</td>
</tr>
<tr>
<td>Number of plan participants who elected to receive a recommendation from the consultant</td>
<td>286</td>
</tr>
<tr>
<td>Number of plan participants who implemented the consultant’s recommended saving rate</td>
<td>79</td>
</tr>
<tr>
<td>Number of plan participants who were offered the SMART plan as an alternative</td>
<td>207</td>
</tr>
<tr>
<td>Number of plan participants who accepted the SMART plan</td>
<td>162</td>
</tr>
<tr>
<td>Number of plan participants who opted out of the SMART plan between the first and second pay raises</td>
<td>3</td>
</tr>
<tr>
<td>Number of plan participants who opted out of the SMART plan between the second and third pay raises</td>
<td>23</td>
</tr>
<tr>
<td>Number of plan participants who opted out of the SMART plan between the third and fourth pay raises</td>
<td>6</td>
</tr>
<tr>
<td>Overall participation rate prior to the advice</td>
<td>64%</td>
</tr>
<tr>
<td>Overall participation rate shortly after the advice</td>
<td>81%</td>
</tr>
</tbody>
</table>
• Result 1: High demand for commitment device

• Result 2: Phenomenal effects on savings rates

<table>
<thead>
<tr>
<th>Participants initially choosing each option</th>
<th>Participants Who Did Not Contact the Financial Consultant</th>
<th>Participants Who Accepted the Consultant's Recommended Saving Rate</th>
<th>Participants Who Joined the SMarT Plan</th>
<th>Participants Who Declined the SMarT Plan</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-advice</td>
<td>29</td>
<td>79</td>
<td>162</td>
<td>45</td>
<td>315</td>
</tr>
<tr>
<td>First pay raise</td>
<td>6.6</td>
<td>4.4</td>
<td>3.5</td>
<td>6.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Second pay raise</td>
<td>6.5</td>
<td>9.1</td>
<td>6.5</td>
<td>6.3</td>
<td>7.1</td>
</tr>
<tr>
<td>Third pay raise</td>
<td>6.8</td>
<td>8.9</td>
<td>9.4</td>
<td>6.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Fourth pay raise</td>
<td>6.6</td>
<td>8.7</td>
<td>11.6</td>
<td>6.1</td>
<td>9.8</td>
</tr>
</tbody>
</table>

*There is attrition from each group over time. The number of employees who remain by the time of the fourth pay raise is 229.*
• Second implementation: Simple letter sent, no seminar / additional information + 2% increase per year

• Lower take-up rate (as expected), equally high increase in savings

<table>
<thead>
<tr>
<th>TABLE 3</th>
<th>AVERAGE SAVING RATES FOR ISPAT INLAND (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EMPLOYEES WHO WERE ALREADY SAVING ON MAY 31, 2001</td>
</tr>
<tr>
<td></td>
<td>Joined SMarT (N=615)</td>
</tr>
<tr>
<td>Pre-SMarT</td>
<td>7.62</td>
</tr>
<tr>
<td>(May 2001) First pay raise (October 2001)</td>
<td>9.38</td>
</tr>
</tbody>
</table>

Note.—The sample includes 5,817 employees who are eligible to participate in the 401(k) plan and have remained with the company from May 2001 through October 2001. The sample includes 414 employees who were already saving at the maximum rate of 18 percent, although they were not allowed to join the SMarT program. The reported saving rates represent the equally weighted average of the individual saving rates.
• Third Implementation with Randomization:
  – Division A: Invitation to attend an informational seminar (40% do)
  – Division O: ‘Required’ to attend information seminar (60% do)
  – 2 Control Divisions

• Two differences in design:
  – Increase in Savings take place on April 1 whether pay increase or not
    (April 1 is usual date for pay increase)
  – Choice of increase in contr. rate (1%, 2%, or 3%) (Default is 2%)
  – Increases capped at 10%

• Results: Sizeable demand for commitment, and large effects on savings +
  Some spill-over effects
<table>
<thead>
<tr>
<th>TABLE 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVERAGE SAVING RATES (%) FOR PHILIPS ELECTRONICS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DATE</th>
<th>Employees Who Were Already Saving in December 2001</th>
<th>Employees Who Were Not Saving in December 2001</th>
<th>All Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Joined SMarT</td>
<td>Did Not Join SMarT</td>
<td>Joined SMarT</td>
</tr>
<tr>
<td>Observations</td>
<td>7,405</td>
<td>7,053</td>
<td>14,458</td>
</tr>
<tr>
<td>Pre-SMarT (December 2001)</td>
<td>5.65</td>
<td>.00</td>
<td>2.90</td>
</tr>
<tr>
<td>Post-SMarT (March 2002)</td>
<td>5.76</td>
<td>.70</td>
<td>3.29</td>
</tr>
</tbody>
</table>

**A. Control Group**

| Observations          | 180          | 339                | 36           | 260         | 815         |
| Pre-SMarT (December 2001) | 5.25        | 5.38               | .00          | .00        | 3.40        |
| Post-SMarT (March 2002) | 6.83         | 5.72               | 5.03         | 1.55       | 4.61        |

**B. Test Group (Divisions A and O Combined)**

| Observations          | 66           | 190               | 10           | 163         | 449         |
| Pre-SMarT (December 2001) | 5.47        | 5.48              | .00          | .00        | 3.12        |
| Post-SMarT (March 2002) | 7.32         | 5.97               | 6.80         | 1.54       | 4.38        |

**C. Division A**

| Observations          | 114          | 149               | 26           | 77          | 366         |
| Pre-SMarT (December 2001) | 5.14        | 5.25              | .00          | .00        | 3.74        |
| Post-SMarT (March 2002) | 6.55         | 5.41               | 4.35         | 1.58       | 4.89        |

**D. Division O**

*Note: The “test” group consists of individuals at Divisions A and O.*
● Issues: Saving too much? Ask people if would like to quit plan

<table>
<thead>
<tr>
<th>Income</th>
<th>25</th>
<th>35</th>
<th>45</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25,000</td>
<td>57</td>
<td>57</td>
<td>56</td>
<td>55</td>
</tr>
<tr>
<td>$50,000</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>54</td>
</tr>
<tr>
<td>$75,000</td>
<td>48</td>
<td>49</td>
<td>46</td>
<td>43</td>
</tr>
</tbody>
</table>

A. Pre-SMarT

<table>
<thead>
<tr>
<th>Income</th>
<th>25</th>
<th>35</th>
<th>45</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25,000</td>
<td>108</td>
<td>90</td>
<td>75</td>
<td>63</td>
</tr>
<tr>
<td>$50,000</td>
<td>98</td>
<td>83</td>
<td>70</td>
<td>62</td>
</tr>
<tr>
<td>$75,000</td>
<td>90</td>
<td>77</td>
<td>63</td>
<td>50</td>
</tr>
</tbody>
</table>

B. Post-SMarT

Note.—The table displays the median income replacement ratios for different age and income profiles, using investment advice software by Financial Engines. The projections are based on the following assumptions: no defined-benefit pension, statutory social security benefits, employee saving rate of 4 percent before SMarT and 14 percent thereafter, employer match of 50 cents on the dollar up to 6 percent, portfolio mix of 60 percent stocks and 40 percent bonds, and retirement age of 65.

● – General equilibrium effect of increase in savings on returns
  – Why didn’t a company offer it? How about teaching people?
• Psychology & Economics & Public Policy:
  
  – Leverage biases to help biased agents
  
  – Do not hurt unbiased agents (cautious paternalism)

• SMartT Plan is great example:
  
  – From Design of an economist...
  
  – ...to Research Implementation with Natural Experiment and Field Experiment
  
  – ...to Policy Implementation into Law passed in Congress: *Automatic Savings and Pension Protection Act*
• However: SMRT may be a unique example for several reasons

  – Defaults are hard to leverage in many situations
    * How to get people to exercise more?
    * Eat less?
    * Pay more attention to hidden information?

  – Saving more is desirable for almost all
    * Interventions on other fronts are more open to criticism

  – Company was open to SMRT: Firm happy to increase savings of employees
    * Often firm would often rather exploit biases than counter-act them
* Example 1: Neglect of mutual fund fees

* Example 2: Overconfidence in trading
• More generally, Nudge agenda (*Sunstein and Thaler, 2011*)
  
  – Use behavioral interventions
  
  – Induce a given behavior

• Great promise beyond savings:
  
  – *Energy*: Display energy consumption of neighbors to lower energy use (OPower)
  
  – *Organ donation*: Require active choice at DMV
  
  – *Taxes*: Reminder letters with deadlines to increase tax compliance
  
  – …
• BUT: Potential problems

• Problem 1. Are we nudging for good?
  
  – Nudges could be used to pursue sinister objectives
  
  – (In fact, companies have used them for decades to increase sales)
  
  – Even when well intentioned, do we know that it is good to induce a given behavior?
    
    * Savings: What is the right savings rate?
    
    * Charitable giving: Does it raise welfare? (earlier lecture)
• Problem 2. (Related) What is the model?
  – A model helps assess the channels
  – Also, gives idea on welfare implications
  – SMRT: Very clear channel
  – Other interventions: not always clear
• Despite these difficulties, there are now numerous attempts in this direction.

• Two more recent examples:

• **Loewenstein and Volpp**’s work on health outcomes
  
  – Series of Randomized Trial
  
  – Leverage incentives with lotteries (probability weighting)
  
  – Use team incentives...
  
  – Outcomes: Weight loss, exercise, remembering to take pill,...

• **Bhargava and Manoli (2012)**
MOTIVATION & BACKGROUND

• **EITC is largest means-tested cash transfer program.** It disburses $58 billion per year to 26 million recipients through income supplement that encourages work

• Fully refundable, supplements earned income by average of 17% which amounts to $2,100. Must file your taxes to claim

• **25% of eligible do not take-up (~6.7m).** Of 25%, 16% do not file taxes, and 9% files taxes (~2.3 m) (Plueger 2010). 9% is focus of this study

• (Many) filing non-claimants receive a reminder notice / claiming worksheet (CP 09 or CP 27) from IRS

• **Policy consequences profound.** Foregone benefits amount to average of 31 days of income, up to ~115 days for some (est. $1,096 benefit, $8,900 income). Health, education, consumption benefits linked to EITC (Hoynes 2011; Dahl and Lochner 2011; Smeeding and Phillips and O’Connor 2001)

• Despite considerable research, incomplete take-up in benefit programs regarded as puzzle to economists (Currie 2006)
EITC BENEFIT SCHEDULE FOR TAX YEAR 2009
RESEARCH STRATEGY

Field experiment to test leading causes of low take-up

- Modify tax documents (notice + worksheet + envelope) and distribute to eligible filing non-claimants

- Simultaneously test three hypotheses regarding role of information (benefits, costs, program rules), informational complexity, and program stigma on response

- Randomize three components independently and distribute in blocks defined by zip code and dependent status

Tax-return data plus micro-data on demographics, EIC claiming history

Survey of perceived incentives. Surveys of ~1200 low to moderate income taxpayers to assess perception of EITC cost/benefit parameters

Psychometric scoring of interventions. Second survey with ~2800 subjects illuminates psychological mechanisms underlying experimental response
AWARENESS AND CONSTRUAL OF INCENTIVES

- 1200 surveys administered across volunteer tax centers in Chicago (1050) and SF (150) in early 2011

- Administered during period when people wait for tax assistance

- Survey elicits (1) tax and demographic information (permits calculation of benefits/eligibility), (2) perceptions of cost and benefit parameters

- Perceived incentives matter (Liebman and Luttman 2011; Chetty and Saez 2009)

- Limits to survey (second survey of 2,800 on Amazon MechTurk)
SURVEY SAYS…

Many are filers are not aware of EITC

- 46% of filers not aware of program (45% of eligible)
- 15% do not regularly open mail from IRS

Perceptions of benefits are inaccurate

- 45% of filers had wrong beliefs of eligibility
- 33% believe they are ineligible, but they are
- 43% of filers underestimate benefits (by 68% on average)

Perceptions of worksheet claiming time are reasonable

- 5% believe worksheet will take > 1 hr, or have WTP > $100

Filers vastly overestimate audit rate

- Median: 15%, Mean: 25%, Actual: 1.1% (EITC: ~1.8%),
- 75% of filers believe audit rate at least 5x actual
EXPERIMENT CONTEXT – ILLUSTRATIVE TIMELINE

2009
- Jan to Dec: Earn income, qualify for EITC, (CA only)
- Feb: File TY 2009 taxes, neglect to claim EITC

2010
- March: IRS reminds you to claim with CP09/27 notice
- Nov: For 41% who return CP, IRS mails check
- Experimental notices mailed to CP non-respondents (CA)
## ORGANIZATION OF TREATMENTS 1

### Table 3

**EXPERIMENTAL INTERVENTIONS BY MECHANISM**

<table>
<thead>
<tr>
<th>MECHANISM</th>
<th>INTERVENTION</th>
<th>DESCRIPTION</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Informational Complexity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simplicity / Complexity (Design)</td>
<td>1. Simple Notice</td>
<td>Relative to complex (original CP) notice, &quot;simple&quot; single-sided notice has simplified layout and excludes eligibility information repeated in worksheet</td>
<td>3,676</td>
</tr>
<tr>
<td>Simplicity / Complexity (Length)</td>
<td>2. Simple Worksheet</td>
<td>Relative to simple worksheet, a complex worksheet includes additional, non-discriminatory, questions regarding eligibility</td>
<td>10,979</td>
</tr>
<tr>
<td><strong>Program Information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefit and Cost Information</td>
<td>1. Benefits (Low and High)</td>
<td>Simple notice reports upper bounds of benefit range</td>
<td>6,761</td>
</tr>
<tr>
<td></td>
<td>2. Transaction Costs (Low and High)</td>
<td>Simple notice provides guidance as to worksheet completion time</td>
<td>3,475</td>
</tr>
<tr>
<td>Penalty/Audit Information</td>
<td>1. Indemnity Message</td>
<td>Worksheet with message to indemnify against penalty for unintentional error</td>
<td>17,027</td>
</tr>
<tr>
<td>General Program Information</td>
<td>1. Attention Envelope</td>
<td>Envelope with message indicating enclosed information is &quot;good news&quot;</td>
<td>17,044</td>
</tr>
<tr>
<td></td>
<td>2. Informational Flyer</td>
<td>One page flyer offers program information and trapezoidal benefit schedule</td>
<td>4,019</td>
</tr>
<tr>
<td><strong>Program Stigma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Stigma</td>
<td>1. Emphasis on Earned Income</td>
<td>Simple notice emphasizes that benefit is reward for hard work</td>
<td>1,844</td>
</tr>
<tr>
<td>Social Stigma</td>
<td>2. Social Influence</td>
<td>Simple notice communicates that similarly situated peers are also claiming</td>
<td>1,753</td>
</tr>
</tbody>
</table>
(A) INFORMATIONAL COMPLEXITY

THEORY

- Poor financial choices due to lack of experience and familiarity with complex documents or low “financial literacy”

- Transfer programs are complicated. EITC has 24 pages of instruction in tax book, 56 pages in separate Publication 596; average length of state FSP application is 12 pages (Bertrand and Mullainathan and Shafir 2006)

- Simplification appears to “improve” choice in many contexts (e.g., Bettinger et al. 2009)

INTERVENTIONS

(1) **Complex Notice**: Tests “design complexity”. Features textually dense design, is two pages, and repeats eligibility information from worksheet. Resembles original CP Notice.

(2) **Complex Worksheet**: Tests “length complexity”. Features additional, “non discriminatory” questions.
“BASELINE” NOTICE

• Headline communicates program eligibility.

• Summary explains purpose of letter and program. Tax Year is specified.

• Recipients instructed to complete worksheet to determine eligibility; eligibility criteria not repeated on notice

• Information on Notice + Worksheet held constant
SIMPLE WORKSHEET

- Guides reader through determination of eligibility (distinct version for dependent and non-dependents)

- Worksheet checks valid SSN, elicits names of eligible dependents, and instructs recipient to sign and return if eligible

- Original CP worksheet, with alternative formatting and organization, not tested
COMPLEX WORKSHEET

- Same formatting and organization as simple worksheet
- Lengthier than simple worksheet due to additional eligibility criteria questions taken from IRS Pub 596 (in Step 1 for dependents version, and in Step 1 and 2 for non-dependents version)
- Example: “I was not a U.S. citizen (or resident alien) for any part of 2009
- Additional criteria do not have bearing on true eligibility as per administrative records
(B) INFORMATION ON BENEFITS, COSTS, RULES

THEORY

- Individuals optimize with respect to incentives
- Individuals have limited attention, may only respond to perceived or known incentives (Kahneman 1986; Taylor and Fiske 1975)
- Basic information regarding incentives helps optimize behavior (e.g., Liebman and Luttmer 2011)

INTERVENTIONS

1. **Benefit Notice:** Generic benefit information (high and low)
2. **Cost Notice:** Information on worksheet claiming time (high and low)
3. **Penalty Worksheet:** “Indemnification” message on claiming worksheet
4. **Informational Flyer:** Information on benefits and program on 1 page flyer
5. **Messaged Envelope:** Persuasion message on envelope
BENEFIT DISPLAY

- Identical to baseline notice in design and content except...

- Headline communicates refund may be up to specific amount determined by number of dependents [IRS did not allow exact benefit amounts]

- Indicated range is $457 for those with no dependents, $5,657 for those with 3 or more dependents, and randomized to be either dependent specific, or overall, maximum for 1 dependent ($3,043), and 2 dependents ($5,028)

- Summary reiterates benefit information
Important information about the Earned Income Credit
You may be eligible for a refund. Claiming your refund usually takes less than 60 minutes.

Do not discard or overlook this notice because you may be entitled to some additional money.

To claim your benefit, simply complete and return this form. This usually takes less than 60 minutes.

What you need to do
Complete the Earned Income Credit Worksheet on Page 3.

If the worksheet confirms that you are eligible for the credit, sign and date the attached worksheet, and mail it to us in the enclosed envelope.

If the worksheet indicates that you are not eligible for the credit, please do not return the worksheet to us.

Next steps
If you are eligible for the credit, we will send you a refund check in 6 to 8 weeks. If you owe back taxes or other debts, such as child support which we are required to collect, we will use your credit to reduce or pay off those debts.

Next year, to receive your refund more quickly, write "EIC" on the EIC line of your form 1040. If you qualify for the credit, the IRS will calculate it for you and send you a check.

Additional information
If you need additional assistance, please call 1-800-829-1040, or visit online at www.irs.gov. For tax forms, call 1-800-TAX-FORM (1-800-829-3676). You can also find tax forms and other helpful documents which explain the EIC program in greater detail (e.g., Publication 996) at www.irs.gov.

COST DISPLAY

• Identical to baseline notice in design and content except...

• Headline communicates that completing worksheet should take less than 60 (or 10) minutes
INFORMATIONAL FLYER

• One page sheet containing incentive information through a graphical display, and text clarifying confusing aspects of eligibility and requirements

• Graphics generally complicated to digest for those of low financial literacy

• Flyer accompanies select baseline notices
Messaged Envelopes

- Treatment envelopes communicate that contents contain beneficial and important information

- Mail marketing firms estimate that up to 44% of non-personal mail is not opened

- Our surveys indicate that 16% of low to moderate income filers do not open mail from IRS
(C) PROGRAM STIGMA

THEORY

- Stigma may deter participation in means-tested benefit programs (e.g., Weisbrod 1970; Moffit 1983; Currie 2006)
- Stigma due to either social sanction (social) or threat to identity (personal)
- Encourage behavior through social influence (Cialdini et al. 1990)
- Energy use and peer feedback (Costa and Kahn 2010)

INTERVENTIONS

“You may be eligible for a refund. Usually, 4 of every 5 eligible people claim their refunds.”
Notice Headline for Intervention 1

“You may be eligible for a refund due to all your hard work.”
Notice Headline for Intervention 2
RANDOMIZATION

- Notice, worksheets, envelopes independently randomized
- Randomization by blocks defined by zip code and dependent indicator (3,148 blocks)
- Oversampling – Baseline notices 4x sample; salience, 3x sample; complex worksheet, .5x sample
- Balancing checks suggest randomization successful
- Mailed mid November 2010; data collected through May 2011
WHAT IS THE COUNTERFACTUAL RESPONSE?

CA Notice Response since July 2010
(IRS Processing Date)

Experimental Notices Mailed
(mid-November 2010)

Pre-Period Response to CP Notices
(since approx July 2010)

Weeks Relative to Experiment Start
SUMMARY OF OVERALL RESPONSE

SUMMARY OF RESPONSE FOR INITIAL & EXPERIMENTAL NOTICE

<table>
<thead>
<tr>
<th></th>
<th>ALL SAMPLE</th>
<th>W/O DEPENDENTS</th>
<th>W/ DEPENDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Response</td>
<td>Benefit Size</td>
<td>Deny</td>
</tr>
<tr>
<td>CP First Notice (CA TY 2009)</td>
<td>0.41</td>
<td>$570</td>
<td>0.02</td>
</tr>
<tr>
<td>Overall Response</td>
<td>0.22</td>
<td>$511</td>
<td>0.01</td>
</tr>
<tr>
<td>Overall Response - Hispanic</td>
<td>0.25</td>
<td>$530</td>
<td>0.01</td>
</tr>
<tr>
<td>Adjusted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control (Complex N + Complex WS)</td>
<td>0.14</td>
<td>$546</td>
<td>0.01</td>
</tr>
<tr>
<td>Simple (Simple N + Simple WS)</td>
<td>0.23</td>
<td>$514</td>
<td>0.01</td>
</tr>
<tr>
<td>Simple + Information</td>
<td>0.28</td>
<td>$531</td>
<td>0.01</td>
</tr>
<tr>
<td>Simple + Low Stigma</td>
<td>0.22</td>
<td>$452</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Notes: This table summarizes the response rate, non-zero benefit size, and denial rate for various experimental samples of interest. The adjustment for the Spanish speaking population is estimated by a response model using 2007 zip code level data on the density of the hispanic population. Please see Appendix for details. The dependent specific response data is not available for the first CP notice.

- Mere receipt of second notice yields 0.22 response (0.14 control condition)
- Language may be a barrier to response
- **Simplification raises response from .14 to .23; Information from .23 to .28; No beneficial effect of lower stigma**
- Effects not driven by denial of claims rate
## Response and Denial by Experimental Treatments

<table>
<thead>
<tr>
<th>Complexity Interventions</th>
<th>YES/NO RESPONSE</th>
<th>YES/NO DENIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline w/ Controls</td>
<td>(1)</td>
</tr>
<tr>
<td>Complex Notice</td>
<td>-0.069***</td>
<td>-0.065***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td></td>
<td>[-49%]</td>
<td>[-46%]</td>
</tr>
<tr>
<td>Complex Worksheet</td>
<td>-0.043***</td>
<td>-0.041***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td></td>
<td>[-31%]</td>
<td>[-29%]</td>
</tr>
<tr>
<td>Informational Interventions</td>
<td>YES/NO RESPONSE</td>
<td>YES/NO DENIAL</td>
</tr>
<tr>
<td>Benefit Display</td>
<td>0.084***</td>
<td>0.083***</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.007)</td>
</tr>
<tr>
<td></td>
<td>[+37%]</td>
<td>[+36%]</td>
</tr>
<tr>
<td>Claiming Cost Display</td>
<td>-0.014</td>
<td>-0.016*</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.008)</td>
</tr>
<tr>
<td></td>
<td>[-4%]</td>
<td>[-7%]</td>
</tr>
<tr>
<td>Indemnity from Penalty Worksheet</td>
<td>0.005</td>
<td>0.006</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td></td>
<td>[+2%]</td>
<td>[+3%]</td>
</tr>
<tr>
<td>Informational Flyer</td>
<td>-0.046***</td>
<td>-0.039***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td></td>
<td>[-17%]</td>
<td>[-17%]</td>
</tr>
<tr>
<td>Envelope Message</td>
<td>-0.007</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
</tr>
<tr>
<td></td>
<td>[-3%]</td>
<td>[-3%]</td>
</tr>
</tbody>
</table>

### Stigma Interventions

<table>
<thead>
<tr>
<th></th>
<th>Personal Stigma Reduction</th>
<th>Social Stigma Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline Response Rate (Simple N + )</td>
<td>Baseline Response Rate (Complex N + )</td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td>(0.011)</td>
</tr>
<tr>
<td></td>
<td>[0.00]</td>
<td>[-4%]</td>
</tr>
<tr>
<td>Fixed Effects, k(Dep)</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pseudo R-Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35,050</td>
<td>35,050</td>
</tr>
</tbody>
</table>

|                           | Baseline Response Rate (Simple N + \) | Baseline Response Rate (Complex N + \) |
|                           | 0.23 | 0.23 | 0.27 | 0.16 | 0.14 | 0.14 |

<table>
<thead>
<tr>
<th></th>
<th>P-value of F-Test - Complexity Interv</th>
<th>P-value of F-Test - Informational Interv</th>
<th>P-value of F-Test - Stigma Interv</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>0.28</td>
<td>0.30</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Predicted Response for Benefit and Cost Notices

- Benefit Display (w/o dependents):
  - Baseline $457: 27%
  - Baseline $3043: 16%
  - Baseline $5028: 16%
  - Baseline $5657: 16%

- Benefit Display (w/ dependents):
  - Baseline $60mn: 23%
  - Baseline 10mn: 23%

- Cost Display:
  - Baseline 60mn: 23%
  - Baseline 10mn: 23%
3 Concluding Remarks

- How to complete a dissertation and be (approximately) happy

1. Know yourself, and put yourself to work
   - Do you procrastinate?
   - Are you afraid of undirected research?
   - Not enough intuition?
   - Not enough technicality?
   - Work in teams with a classmate
2. Economics is about techniques AND about ideas

- Rule 1. Study the techniques

- Everyone needs a knowledge of:
  
  * Modelling skills (decisions, game theory, contracts, behavioral models)

  * Econometrics (asymptotics, applied metrics)

  * (At least) one field (methodology, questions, previous research)
- **Rule 2.** Think of interesting ideas

- Start from new idea, not from previous papers. Ex.: Mas-Moretti on Safeway data

- Think of an idea that can fix a broken literature (Levitt). Ex.: Fehr-Goette on cab drivers

- Connect two literatures which were unconnected. Ex.: Eisensee-Stromberg on political economy + behavioral

- **Rule 3.** Explore technique you need for idea
  
  * Ideas often come first

  * It will be much easier to learn technique once you have an interesting problem at hand
3. What are good ideas?

- 1% of GDP (Glaeser)

- New questions (better) or unknown answers

- Questions you care about and topics you know about (comparative advantage: List)

- Socially important topics (Akerlof)

- Good research is always useful, even if not policy-relevant
4. Look for occasions to learn:

- Attend seminars (including student lunch talks)
- Attend job market talks
- Do not read too much literature
- Discuss ideas with peers, over lunch, with yourself
- Get started on some data set
- Be curious
5. Above all, do not get discouraged...

- Unproductive periods are a fact of life
- Ideas keep getting better (and economics more fun) with exercise
- Work hard
- Keep up the exercise!