Who gets what item(s)?

- Economics is all about scarcity
- How do we know who *should* get certain items?
  - Economics usually use Utilitarian SWF: $\sum u_i$
- Assuming no externalities, markets are fantastic.
- But what if markets are morally repugnant?
Examples of Assignment Problems

- Offices
Examples of Assignment Problems

- Offices

- Parking Spaces
Examples of Assignment Problems

- Offices

- Parking Spaces

- Class Seats
Overview - The Assignment Problem

- $j$ agents, and $k$ indivisible objects. Each agent is assigned one object.
- Normally $j \geq k$.
- Agents have a (possibly) different value, $v_{jk}$, for each object.

**Objective:** Maximize total welfare of the assignment, $W = \sum v_{jk}$.

- Values are private and unknown to the institutional designer.
- *Ex post* trading is assumed to be infeasible, either due to institutional constraints or high transaction costs.
Economist love auctions.
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Countless hours spent on all types of auctions.
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Countless hours spent on all types of auctions.

▶ English
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- English
- Dutch
Enter Auctions

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  - English
  - Dutch
  - $k^{th}$ price
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  - Dutch
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- Simple (English) auctions are not perfect and have many problems.
Enter Auctions

- Economist love auctions.
- Countless hours spent on all types of auctions.
  - English
  - Dutch
  - $k^{th}$ price
- Simple (English) auctions are not perfect and have many problems.
- So we come up with other mechanisms for allocations.
Caldara and Porter (2014) design an auction mechanism in which tokens used in auction are traded before auction in a market.

- **Setting:** preferences highly correlated and varied in magnitude.
- **Finding:** little improvement over preference-based assignment.

Several potential problems:

- Uncertainty about whether to buy or sell tokens.
- Uncertainty about the value of a token.
- Need someone on both sides of the trade.
- Market still requires cash transfers.
Our Environment

- We attempt to monetize tokens through costly effort:
  - Value of token pinned down by outside option.
  - One sided acquisition.
Introducing time costs may change concept of efficiency.
Positive Externality Mechanism

- Introducing time costs may change concept of efficiency.
- Important for activity to be socially valuable.

Positive Externality Mechanism (PEM):

\[ \text{Benefit}_i = \gamma N - \sum_{j \neq i} e_j \]

\[ \gamma \in \{0, 1, 1.5\} \]

Effect on assignment efficiency is unclear.
Positive Externality Mechanism

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\[
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\]
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- \( \gamma \in \{0, 1, 1.5\} \)
- effect on assignment efficiency is unclear.
The assignment is fairly efficient (nearly 85%).
Assignment efficiency not impacted by positive externality.
Tokens purchased also not impacted by externality.
Design builds upon Caldara and Porter (2014)
6 participants and 6 items per group.
Medium (0.4) contention only.
Trade off between up to $10 or 4 tokens.
English Auction (DGS)
18 periods with random re-matching between periods.
Paid for 1 randomly selected round.
**PEM Multiplier:** $\gamma \in \{0, 1, 1.5\}$
## MEDIUM CONTENTION

<table>
<thead>
<tr>
<th></th>
<th>Item 1</th>
<th>Item 2</th>
<th>Item 3</th>
<th>Item 4</th>
<th>Item 5</th>
<th>Item 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
<td>$24</td>
<td>$11</td>
<td>$10</td>
<td>$11</td>
<td>$9</td>
<td>$3</td>
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<td>Participant 2</td>
<td>$12</td>
<td>$23</td>
<td>$17</td>
<td>$7</td>
<td>$5</td>
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<td>$14</td>
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<td>$3</td>
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<td>Participant 4</td>
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<td>$17</td>
<td>$10</td>
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<td>Participant 5</td>
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<td>$19</td>
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<td>$17</td>
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<td>$4</td>
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<td>Participant 6</td>
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<td>$19</td>
<td>$15</td>
<td>$12</td>
<td>$6</td>
<td>$7</td>
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</tbody>
</table>

Clearing Price = $12 $12 $8 $8 $0 $0
Effort Interface

Time Remaining: 23

Effort Division

<table>
<thead>
<tr>
<th>Tokens</th>
<th>Cash</th>
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<tbody>
<tr>
<td>0</td>
<td>$10.00</td>
</tr>
<tr>
<td>1</td>
<td>$7.50</td>
</tr>
<tr>
<td>2</td>
<td>$5.00</td>
</tr>
<tr>
<td>3</td>
<td>$2.50</td>
</tr>
<tr>
<td>4</td>
<td>$0.00</td>
</tr>
</tbody>
</table>

All other participants receive $0.50 for each token you acquire.

Tokens are used to bid on items. Cash is added directly to your earnings for the period.

Submit

<table>
<thead>
<tr>
<th>Item 1</th>
<th>Value: 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 2</td>
<td>Value: 22</td>
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<tr>
<td>Item 3</td>
<td>Value: 6</td>
</tr>
<tr>
<td>Item 4</td>
<td>Value: 19</td>
</tr>
<tr>
<td>Item 5</td>
<td>Value: 13</td>
</tr>
<tr>
<td>Item 6</td>
<td>Value: 14</td>
</tr>
</tbody>
</table>
English Interface

Time Remaining: 32

Accounting

Tokens: 1

Item 1
Value: 9
Token Price: 0

Item 2
Value: 13
Token Price: 0

Item 3
Value: 9
Token Price: 0

Item 4
Value: 24
Token Price: 0

Item 5
Value: 5
Token Price: 0

Item 6
Value: 12
Token Price: 0

Submit
Session Summary

- 156 subjects recruited at random from ESSL subject pool, only participated once.
- $7 show up payment + incentivized quiz questions (up to $1).
- Sessions lasted roughly 90 minutes.
- Average subject earnings across all treatments were roughly $30.
Hypotheses

1. Assignment efficiency $> \text{baseline (Caldara & Porter 2014)}$
   - more price info, clear token price, one-sided acquisition
2. Average token acquisition is non-decreasing in preference magnitude.
3. Average token acquisition is non-decreasing in $\gamma$.

The effect of $\gamma$ on assignment efficiency is unclear.
Token Acquisition

Group Tokens by Externality

<table>
<thead>
<tr>
<th>Externality</th>
<th>Group Tokens</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>14.07</td>
</tr>
<tr>
<td>1</td>
<td>14.35</td>
</tr>
<tr>
<td>1.5</td>
<td>13.71</td>
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</table>
Assignment Efficiency

Average Efficiency by Externality

<table>
<thead>
<tr>
<th>Externality</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>86.61</td>
</tr>
<tr>
<td>1</td>
<td>85.90</td>
</tr>
<tr>
<td>1.5</td>
<td>85.17</td>
</tr>
</tbody>
</table>
Successful monetizing tokens with costly effort.

Efficiency of assignment unaffected by positive externality.
  - Overall efficiency increases with positive externality.

Mechanism may be useful for organizations that need to efficiently allocated resources without using cash.
Questions/Comments?