To Tender or not to Tender?
Deliberate and Exogenous Sunk Costs in a Public Good Game

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September 2016
Introduction

- In the field, factual rents from a contest often depend on what the winning party makes of it
- Example: Imagine two corporations tendering for a construction project
  - After decision to award the project, the subdivisions of the corporation can deliver input to construct the project
- Duopoly of unitary players

  Each competitor consists of different segments (fuselage, wings, turbines...)

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Each competitor consists of different segments (fuselage, wings, turbines...
Introduction (cont.)

Two stages:

1. On the corporation level, each group spends resources to secure the project

2. Subdivisions invest capital/effort for a group enterprise

- Theoretically, contribution in stage 2 should be independent of the amount of money spent in stage 1
- However, sunk cost character → Potential sunk cost fallacy (Arkes and Blumer, 1985)
- Alternatively: Reciprocal / gift exchanging process, feeling entitled
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Setup – First Stage

Individual endowment $T = 200$ tokens
100 for first stage, 100 for second stage

\[
\sum_{k \in K} v_k + \sum_{m \in M} v_m
\]

Competition Treatment

Win
Setup – First Stage

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Competition Treatment

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Setup – Second Stage

Winning group project

MPCR = 0.8

Win

Losing group project

MPCR = 0.4

\[
\sum_{k \in K} v_k + \sum_{m \in M} v_m
\]
Setup – Second Stage

\[
\frac{\sum_{k \in K} v_k}{\sum_{k \in K} v_k + \sum_{m \in M} v_m}
\]

Winning group project: MPCR = 0.8

Losing group project: MPCR = 0.4
Setup – Second Stage

MPCR = 0.8

Winning group project

Win

MPCR = 0.4

Losing group project

\[
\sum_{k \in K} v_k + \sum_{m \in M} v_m
\]
Equilibrium Strategies

Second Stage:

\[ \pi_i (k \in K) = T2 - w_i + MPCR \cdot \sum_{k \in K} w_k \]

As \( \pi'_i < 0 \) and \( \pi''_i = 0 \), there exists a corner solution \( w_i = 0 \).

First Stage:

\[ \pi_i (v_i) = T1 - \frac{v_i + \sum_{k \neq i} v_K}{v_i + \sum_{k \neq i} v_K + \sum_{m \in M} v_M} \cdot z - v_i \]

with \( z = 0 \) being the expected earnings from stage 2. Again, a corner solution exists with \( v_i = 0 \).
Equilibrium Strategies

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Behavioural Hypotheses

\[ w_i \mid \text{win, comp} > w_i \mid \text{win, ex} > w_i \mid \text{lose, ex} > w_i \mid \text{lose, comp} \]

Second inequality  In line with established literature on public goods games (Gunnthorsdottir et al., 2007; Isaac and Walker, 1988)

First and last inequality  Sorting and signalling effects
Behavioural Hypotheses

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**First and last inequality** Sorting and signalling effects.
Behavioural Hypotheses

\[ \overline{w_i} \mid \text{win, comp} \quad > \quad \overline{w_i} \mid \text{win, ex} \quad > \quad \overline{w_i} \mid \text{lose, ex} \quad > \quad \overline{w_i} \mid \text{lose, comp} \]

**Second inequality** In line with established literature on public goods games (Gunnthorsdottir et al., 2007; Isaac and Walker, 1988)

**First and last inequality** Sorting and signalling effects
Procedures

- Recruited 186 participants using ORSEE (Greiner, 2004)
- Experiment programmed in z-Tree (Fischbacher, 2007) and conducted at CeDEx lab, Nottingham UK
- Each session took about 1 hour, including reading the instructions, taking an SVO measure, a trial period, the main part of the experiment, a questionnaire and payment
- Mean income £ 12.00 (about € 16.00)
Results – First Stage

- Average Contribution at about 29 tokens
- 0 tokens as modal contribution.

Average Contribution: 28.58
Frequency of observations as bar label
Results – First Stage (cont.)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First stage OLS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contribute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social value orientation (SVO)</td>
<td>-2.384**</td>
<td>-1.849*</td>
</tr>
<tr>
<td>(1.05)</td>
<td>(1.02)</td>
<td></td>
</tr>
<tr>
<td>Risk parameter</td>
<td>2.479</td>
<td>2.596</td>
</tr>
<tr>
<td>(2.10)</td>
<td>(1.94)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>9.866</td>
<td>16.148**</td>
</tr>
<tr>
<td>(6.14)</td>
<td>(6.18)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>2.251</td>
<td>3.493**</td>
</tr>
<tr>
<td>(1.39)</td>
<td>(1.43)</td>
<td></td>
</tr>
<tr>
<td>Work alone</td>
<td>2.422</td>
<td></td>
</tr>
<tr>
<td>(1.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family and friends important</td>
<td>-9.839</td>
<td></td>
</tr>
<tr>
<td>(7.10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trust in others</td>
<td>17.455***</td>
<td></td>
</tr>
<tr>
<td>(5.97)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Equality</td>
<td>-3.429**</td>
<td></td>
</tr>
<tr>
<td>(1.67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>86.402</td>
<td>42.992</td>
</tr>
<tr>
<td>(64.29)</td>
<td>(68.85)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>93</td>
<td>93</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.122</td>
<td>0.448</td>
</tr>
</tbody>
</table>

* p<0.10, ** p<0.05, *** p<0.01
Standard errors in parentheses.
Study major dummies not listed.

- SVO values negatively affect contest expenditures (robust)
- (Self assessed) risk parameter no explanatory power
Results – Second Stage

<table>
<thead>
<tr>
<th></th>
<th>Win</th>
<th>Lose</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exogenous</td>
<td>34.3</td>
<td>19.5</td>
<td>26.9</td>
</tr>
<tr>
<td>Competition</td>
<td>37.2</td>
<td>16.3</td>
<td>26.8</td>
</tr>
<tr>
<td>Overall</td>
<td>35.8</td>
<td>17.8</td>
<td>26.8</td>
</tr>
</tbody>
</table>

Table 2.2: Average individual contribution

- Second inequality from hypothesis strongly confirmed
- First and third inequality rejected
Results – Second Stage

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Exogenous</th>
<th>Competition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
<td>34.3</td>
<td>37.2</td>
</tr>
<tr>
<td>10 - 20</td>
<td>19.5</td>
<td>16.3</td>
</tr>
</tbody>
</table>

- Second inequality from hypothesis strongly confirmed
- First and third inequality rejected
Results – Relation between first and second stage contribution

- Positive relationship in the *competition* treatment
- Losing the contest as constant drag on a group’s cooperation level
Results – Relation between first and second stage contribution

Subjects who contribute more relative to their other group members, tend to reduce their spending level.

R-squared: 0.255
Conclusion

- Contest expenditures perceived as sunk costs triggering higher contribution to the team project
- Sunk cost character only prevails for deliberately accrued spendings
- Losing the contest as constant obstacle for group’s cooperativeness

