How Category Reporting Can Improve Fundraising

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Reporting donations to charity...

Exact reporting

<table>
<thead>
<tr>
<th>Name</th>
<th>Donation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr A</td>
<td>20 EUR</td>
</tr>
<tr>
<td>Ms B</td>
<td>100 EUR</td>
</tr>
<tr>
<td>Mr C</td>
<td>0 EUR</td>
</tr>
<tr>
<td>Miss D</td>
<td>40 EUR</td>
</tr>
<tr>
<td>Mrs E</td>
<td>0 EUR</td>
</tr>
</tbody>
</table>
More common to categorise...

<table>
<thead>
<tr>
<th>Gold Patrons</th>
<th>&gt; 50 EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms B</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Silver Patrons</th>
<th>&gt; 10 EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr A</td>
<td></td>
</tr>
<tr>
<td>Miss D</td>
<td></td>
</tr>
</tbody>
</table>
Model Timing

Charity sets reporting system

Donors donate

Observers offer donors social esteem
Model

• 3 players: Charity, donor and observers
• Donor is either a miserly (M) or generous (G) type
• Type is private information
• Priors: generous with probability $0 < p < 1$
• Donor chooses to donate some $x \in [0, \infty)$
• Donor’s intrinsic payoff: $m(x)$ if miserly and $g(x)$ if generous
  – $m(x)$: strict max at $x_m$, strictly increasing (decreasing) for $x < x_m$ ($x > x_m$)
  – $g(x)$: strict max at $x_g$, strictly increasing (decreasing) for $x < x_g$ ($x > x_g$)
  – $x_m < x_g$
• Single crossing properties
  – SCP 1:
    \[ g'(x) > m'(x) \text{ for } x \leq x_m \]
  – SCP 2:
    \[ |g'(x)| < |m'(x)| \text{ for } x \geq x_g \]
Model

- Observers see charity’s report and infer whether donor is generous or miserly
  - Exact reporting: Observe $x$
  - Category reporting: Only observe whether or not $x \geq \hat{x}$

- Inference function, $q(x) \in [0,1]$
  - With categories: only 2 inferences

- Donor’s esteem payoff, $Eq$, for $E > 0$

- Donor’s overall payoff

\[
U(x, G, q) \equiv g(x) + Eq(x)
\]

\[
U(x, M, q) \equiv m(x) + Eq(x)
\]
Equilibria

• Perfect Bayesian Equilibria refined using Intuitive Criterion (& sometimes D1)
• Complete existence theorem in paper
  – Only main results here, focus on:
    • Pure strategies
    • Optimal thresholds
Exact reporting outcomes

Define \( x_H > x_m : m(x_m) = m(x_H) + E \)

1. Trivial separation

2. Separation

Can category reporting increase donations further?
A high threshold can increase donations

Define \( x_{gH} > x_g : g(x_g) = g(x_{gH}) + E \)
A low threshold can increase donations

- To increase miserly’s donation must reduce donation of generous and force pooling
- Surprisingly, providing \( m(x) \) is concave, can always increase the expected donation
- Define \( x_L > x_m: m(x_m) = m(x_L) + pE \)

\begin{align*}
\hat{x} \quad \text{Gold} \\
\text{Silver} \\
0 \quad x_m \quad x_g \quad x_L \quad x_H \quad x
\end{align*}
Why a low threshold works

\[ m(x) + E < \frac{pE}{E} < \frac{x_L - x_m}{x_H - x_m} \Rightarrow x_L > px_H + (1 - p)x_m \]
High or low threshold?

- \( p \) is critical
- Exp donation high thresh - Exp donation low thresh

\[ p \]

\[ 0 \]

\[ p \]

\[ 1 \]

- Effect of \( E \) on critical \( p \) is ambiguous.
The low category pooling trap

- Unfortunately, a less desirable equilibrium may also exist...
- Define $x_{gL} > x_g : g(x_g) + pE = g(x_{gL}) + E$
“Unravelling” of pooling equilibria breaks down

• Exact reporting
  – Candidate pooling eqm with both types donating $x'$
  – Exists $x'' > x'$: $m(x') + pE = m(x'') + E$
  – Then intuitive criterion implies $q(x'' + \varepsilon) = 1$
  – $G$ deviates to $x'' + \varepsilon$ given SCP2... Pool broken

• Category reporting
  – As above...
  – If $x'' + \varepsilon$ same category as $x'$, $x'' + \varepsilon$ insufficient to signal
  – $G$ needs to increase up to the threshold
  – Ambiguous incentive to do so... Pool may survive

• Many-to-one mapping from actions to signals
  – Prevents “unravelling” of pooling equilibria using standard refinements
Avoiding low category pooling

• Category reporting (avoiding low category pooling)
  1. Unambiguously increases donations if \( E \) is low
  2. Unambiguously decreases donations if \( E \) and \( p \) are high

• Low \( E \): Trivial separation with exact reporting
  – \( x_g > x_H \rightarrow x_{gL} > x_L \)
  – Low threshold definitely definitely available

• High \( E \): Separating equilibrium with exact reporting
  – High \( p \)
  – Exact reporting high expected donation:
    • Miserly large incentive to donate and generous most likely
  – Category reporting low expected donation:
    • Generous less incentive to signal, so \( x_{gL} \) very low
    • Generous donates less than he would under exact reporting
Further results

• Fundraiser competition
  – Reduces the fundraising power of category reporting

• “More continuous” donor type distribution
  – High thresholds no better than exact reporting
  – Low thresholds remain effective
Results Summary

• Signalling insightful on optimal donation categorisation

1. Categorising can unambiguously increase donations if
   a) Generous type: High incentive to signal
   b) Miserly type: Low incentive to imitate him
      – Prior probability of generous type and esteem are low.

2. Both high threshold and low threshold can work

3. Low threshold best if prior is low, otherwise use high

4. If conditions in 1. not fulfilled
   a) Can still increase donations
   b) Low category pooling equilibrium, donations decrease

5. Categorising interferes with standard “unravelling” of pooling equilibria
Further work

• Fundraising markets
• General properties of signalling games with actions and signals mapping many-to-one
• Empirical work on categorisation
Thank you for listening