Modeling Evolutionarily Stable Strategy for Firms’ Social Preferences under Cournot Competition

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Outlines

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Motivation

• **Traditional economics can explain:**
  - Why firms’ selfish behavior is best strategy for supporting and increasing of his own profit;
  - Why cartel can increase profits of participants;
  - Competitive equilibrium as result of ‘invisible hand’

**BUT can not explain:**
- Altruist and punisher can also earn profits;
- Firms which follow such model of behavior can gain more profit than selfish firm
Literature review

**Pro** egoist behavior
- Individual is egoist: the more good he receives, the more he benefits [Myerson, 1982]
- The benefits of one agent do not mean anything to the other [Filatov, 1998]
- Positive effect of ‘Invisible hand’ [A.Smith]

**Contra** egoist behavior
- Behavior stays rational, when firm combines selfishness and social norms [McFadden, 2009]
- Mutual gains from cooperation generate altruism [Bowles, 2003]
- Punish behavior is more effective than egoism under strong social rules [Tanaka, 2000]
Interaction of people and institutions
Research question

• **Question** is why some attitude of firm to his rivals is unchangeable (constant), but others attitudes can change?

*More accurate:*

• **Paper goal** is to investigate which social preferences of firms are evolutionarily stable strategy (do not change under impact of their rivals) under quantity competition on homogeneous product market.
# Types of firms’ behavior

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<thead>
<tr>
<th>Cost/Benefit</th>
<th>Private costs</th>
<th>Private benefits</th>
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<tbody>
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<td>Outsider benefits</td>
<td>Altruists</td>
<td>Co-operators (Cartel)</td>
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<tr>
<td>Outsider costs</td>
<td>Punishers</td>
<td>Selfish persons (Egoists)</td>
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*Cost/Benefit* refers to the financial impact on firms, while *Private costs* and *Private benefits* denote the firm's internal costs and benefits, respectively.
Types of firms’ behavior

selfish ($\alpha=0$):
\[ \pi_i = P \cdot q_i - v_i \cdot q_i \quad \text{for} \quad q_i \geq 0 \rightarrow \max \]

altruistic ($\alpha>0$):
\[ \pi_i = P \cdot q_i - v_i \cdot q_i + \alpha_i \cdot \sum_{j \neq i} \pi_j \quad \text{for} \quad q_i \geq 0 \rightarrow \max \]

punishing ($\alpha<0$):
\[ \pi_i = P \cdot q_i - v_i \cdot q_i + \alpha_i \cdot \sum_{j \neq i} \pi_j \quad \text{for} \quad q_i \geq 0 \rightarrow \max \]
Competition model 1: assumptions

- \( n \) firms compete in quantity;
- Linear market demand and the cost of competitors is common knowledge;
- Each firm knows his own attitude and attitudes of others to himself;
- Firm selects an attitude giving for his profit more than average in industry;
- Firm saves successful model of behavior as norms, rules or institutes.
Competition model 1: data
Competition model 1: egoists’ attitudes
Competition model 1: egoists’ profits
Competition model 1: egoists’ quantities

[Image of a graph and a table related to the model]
Competition model 2: altruists’ attitudes
Competition model 2: altruists’ profits
Competition model 2: egoists’ quantities
Competition model 3: altruists’ attitudes
Competition model 3: altruists’ profits
Competition model 3: egoists’ quantities
Competition model 3: price
Competition model 3: quantity
Conclusions

• “Selfishness" attitude is not an evolutionarily stable strategy (ESS)
• The attitude of "altruism" is ESS if altruist have higher productive efficiency (e.g., lower average costs) under competition with selfish firm. But if a firm with lower average cost is less altruistic, then the two are eventually transformed into punishers and "altruism" is not ESS in such case.
• The attitude of "punisher" is also ESS if punisher has higher productive efficiency (e.g., lower average costs) under competition with altruist. But if a firm with smaller average cost is lower punisher, the two firms become altruists and "punisher" is not ESS in this case.
THANKS FOR YOUR ATTENTION!