From Monopoly to Competition: Optimal Contests Prevail

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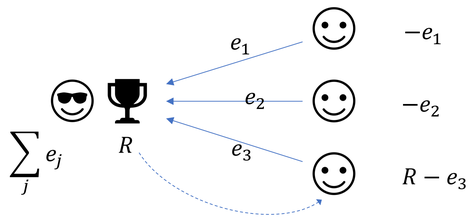
Motivating question: ***How should conference organizers design best paper award contests, when there are multiple conferences competing for paper submissions?***

A Contest

- Abstraction of a contest in real life:
  sports competition, best paper award, etc.

In a contest, there are:

- 1 contest designer, >=1 contestants.
- The designer has a prize/reward.
- Contestants exert *efforts* to compete for the reward.
- The designer wants to maximize the sum of efforts from the contestants.
- Each contestant wants to maximize the (expected) reward he/she gets - the effort.



Examples of a contest:

- All Pay Auction (APA): the contestant with $\max_j e_j$ wins the prize. (breaks ties randomly)
- Tullock Contest: parameterized by $\tau \geq 0$; each contestant wins the prize with probability

$$\frac{e_j^\tau}{\sum_k e_k^\tau}$$

Lemma [1]**:** APA induces more efforts than any Tullock contest does, regardless of the number of contestants.

Main Model: Compitition among Contests

Motivation:

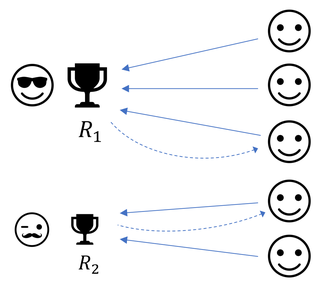
- Oftentimes in practice, there are *multiple* contests available to the contestants at the same time.

Model:

- $m \geq 2$ contest designers, $n \geq 1$ contestants.
- Each contest designer i chooses a contest $C_i \in S_i$ from a set of contests S_i with reward $R_i > 0$.
- Each contestant chooses a contest to participate in.
- The contestants participating in the same contest play the single contest game (described on the left).

Notes:

- Contest designers can be *asymmetric*: different S_i and R_i
- Contestants are *symmetric*. In particular, they play a symmetric mixed-strategy equilibrium in the game of choosing contests to participate in.



Two competing factors: effort vs. participation

- A contest that requires less efforts from the contestants (e.g., a Tullock contest with small τ) encourages more participation.

Main Result: Optimal Contests Prevail

Theorem 1: It is an equilibrium for the contest designers to choose the contest $C_i^* \in S_i$ that is the optimal contest in the single contest game.

(optimal: maximizing the sum of efforts)

For example, if $S_i = \{\text{APA}, \text{Tullock}\}$, *then every designer will choose* APA.

Answer to the motivationg question:
There is no need for the organizers to consider the competition from other conferences!

In other words, effort dominates participation!

Other Results

Theorem 2 (uniqueness): The equilibrium in Theorem 1 is *dominant* and *unique*, under the following natural assumption:

- every contest $C_i \in S_i$ has "monotonically decreasing utility": in the single contest game, when the number of contestants increases, the expected utility of each contestant decreases.

Theorem 3 (Pareto-optimality): The equilibrium in Theorem 1 is *Pareto-optimal* for the designers.

Observation 4 (asymmetric contestants): The conclusion of Theorem 1 breaks if the contestants are *asymmetric*, in the sense that:

- They play an asymmetric participation equilibrium.
- Or they have different unit costs of effort c_j (exerting effort e_j costs the contestant $c_j e_j$).

Reference

[1] Baye, M. R.; Kovenock, D.; and De Vries, C. G. 1996. The all-pay auction with complete information. Economic Theory, 8(2): 291–305.