INCENTIVES AND AGENTS' COOPERATION: COMPLETE INFORMATION FRAMEWORK

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Complete information framework of incentive problem with the only principal was studied in [1]. There the optimal solutions for principal were found under assumption of non-cooperative agents' behavior. Principal's payoff $\Phi(y) = H(y) - \sum_{i=1..n} \sigma_i(y)$ (where $y = (y_1, ..., y_n)$ - agents' actions profile) was considered to be the difference between its profit and non-negative payments to agents. *i*-th agent payoff $f_i(y) = \sigma_i(y) - c_i(y)$ was supposed to be the difference between payment from principal and cost for agent of profile *y* production.

Under assumption that agents can not form coalitions and act jointly and having various constraints on possible $\sigma_i(y)$, different payment profiles (referred below as incentive mechanisms - IM) become optimal to principal:

1. If payments to *i*-th agent may depend upon whole actions profile, then IM

   (1) $\sigma_i(y) = \begin{cases} c(y_i^*, y_{-i}) + \varepsilon_i & when\ y_i = y_i^* \\ 0 & when\ y_i \neq y_i^* \end{cases}$ (where $y^* \in Arg \max [H(y) - \sum_{i=1,...,n} c_i(y)]$)

   implements y^* in dominant strategies and is ε-optimal for principal.
2. If payments to *i*-th agent may depend only on its action y_i, then IM

   (2) $\sigma_i(y_i) = \begin{cases} c_i(y_i^*, y_{-i}^*) + \varepsilon_i, & y_i = y_i^* \\ 0, & y_i \neq y_i^* \end{cases}$ (with the same y* as in IM 1).

   implements y^* as the only Nash equilibrium and is ε-optimal.
3. If principal observes not the actions profile itself but some result $z = g(y)$ and its payoff depends only on *z*, then IM

   (3) $\sigma_i(z) = \begin{cases} c_i(y^*(z^*)) + \varepsilon_i & z = z^* \\ 0 & z \neq z^* \end{cases}$, where

   $y^*(z^*) \in Arg \min_{y: g(y) = z^*} \sum_{i=1..n} c_i(y)$, $z^* \in Arg \max [H(z) - \sum_{i=1...n} \sigma_i(z)]$

   implements y^* as the only Nash equilibrium and is ε-optimal.

In all three IM agents get zero payoffs in equilibrium.

The aim of this paper is to check the robustness of these results when we let agents to play cooperatively. Note that in this game any cooperation of agents (in contrast to that studied in [2]) is undesirable for principal.

We show that important point for such robustness is a possibility for principal to offer contracts where payment to every agent may depend upon whole agents' actions profile or result *z* (like in IM 1 and 3). If principal is restricted to use payments, that depend only on individual actions, it have to pay extra charges to implement desired action. Finding the minimal set of these charges is a linear programming problem.

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I intend to submit a paper and to present it at the Conference.