

The Power of Weak Incentives*

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ABSTRACT

A mechanism in weak incentives offers every agent the same outcome regardless of their reported type. In such a mechanism, reporting the truth or any misrepresentation guarantees the same payoff. Actual reports depend on human behavior. This paper shows that, for a large class of behavioral assumptions, mechanisms in weak incentives can solve externality problems in large economies. An experiment was used to test the effectiveness of a mechanism in weak incentives using a congestion game. In the laboratory, the mechanism achieved an efficiency of 95%.

Categories and Subject Descriptors

J.4 [SOCIAL AND BEHAVIORAL SCIENCES]

General Terms

Economics

Keywords

Weak Incentives, Behavioral Implementation, Congestion Pricing

1. EXTENDED ABSTRACT

A mechanism to select an outcome based on reported information is considered effective if it converges over time to the desired outcome when played by human beings. An outcome is an allocation and a set of transfers. Hurwicz [1] recognized that truth-telling must be at least as good as any other option for a mechanism to be effective.

It is widely believed that the better truth-telling is relative to other options, the more effective a mechanism will be. This is generally the case, but is not always possible to do. For example, suppose that societies reject mechanisms that implement different transfers to agents reporting different

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information, but obtaining identical allocations. Even when transfers can depend on reported information, the number of agents could pose a problem by itself. Consider a mechanism for the efficient provision of public goods in an economy with a large number (continuum) of agents. In this economy no individual report can change the social allocation, hence all reports made by a single agent will be associated with same payoff.

This paper explores the above problem and studies mechanisms in weak incentives. A mechanism in weak incentives offers every agent the same outcome regardless of the reported type. In such a mechanism, no agent can increase his payoff by misrepresenting his private information, thus attaining the weakest level of incentive compatibility.

This paper shows that mechanisms in weak incentives can be effective in solving problems in which welfare is a concave function of the average type. In these cases, only average truth-telling is necessary to attain efficiency. Furthermore, small deviations around the true average value will produce only small reductions in welfare due to concavity. Both conditions, dependence on average values and concavity of the welfare function are common place in economic problems.

The main drawback behind the idea of average truth-telling is that no agent knows what the true average is. Thus, it is not reasonable to expect agents to instantaneously coordinate in a Nash equilibrium associated with the true average. The question is, does actual human behavior converge to average truth-telling in a mechanism in weak incentives? This paper shows that, for a large class of behavioral assumptions, mechanisms in weak incentives do converge to average truth-telling. Furthermore, it is shown that human subjects do converge to average truth telling using an experiment.

A traffic congestion game is used to test the effectiveness of a mechanism in weak incentives. A typical traffic congestion problem has a concave welfare function that depends on the average true value of time. The mechanism uses agents' messages about their value of time and the observed level of traffic to calculate congestion prices. Traffic observations are used to measure the marginal impact, in time, of adding an extra vehicle to the road. Messages are used to measure the cost of the marginal increase in time. In the experiment, the mechanism is called the *Message price* system.

This paper shows that high levels of efficiency can be achieved

with a mechanism in weak incentives. The experimental design consists of a congestion game in which 14 subjects independently decide whether to “drive” or “not drive” on a fixed road for 30 rounds of play. At the beginning of the game, every subject was randomly and privately assigned two numbers: i) a value of commuting and ii) a value of time. Neither the distribution nor the support of values was revealed to the subjects. Types were chosen to fulfill the following three functions: (i) replicate a large market, (ii) minimize the set of agents who belong to both the Nash equilibrium without congestion pricing and the social optimum, and (iii) allow for zero efficiency gains with the message system.

The message price system was compared with the optimal congestion price. The experimental results are promising. The message price system achieved an efficiency of 94.99% relative to the efficiency achieved by the optimal congestion price.

2. REFERENCES

- [1] L. Hurwicz. On Informationally Decentralized Systems. In *Decision and Organization*. North-Holland, 1972.