Mechanism Design with Unobservable Information Manipulation *

Wenji Xu †

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Traditional mechanism design takes information structure as the model’s primitive and seeks to characterize the optimal mechanism (i.e. rules of the game) from the designer’s perspective. It is widely assumed that information structure (the joint distribution of players’ private signals) is exogenous and common knowledge among players. This assumption gives rise to the celebrated revelation principle [Myerson, 1981] which states that instead of considering the huge set of all possible extensive form games, the mechanism designer can, without loss of generality, consider only the set of incentive compatible direct mechanisms.

However, in some economic problems, it is reasonable to assume that economic agents may influence or manipulate other agents’ information structure. In addition, their strategy to manipulate information is often unobservable (or not contractible) to the mechanism.

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†Department of Economics, University of Chicago, Email: wenji@uchicago.edu
designer. For example, consider a monopolistic seller of gasoline-powered vehicles, who wants to design a selling mechanism to screen buyers (who possess private information about their valuation of the good). The buyer’s private information may be endogenously influenced by some third party such as the government or activist groups (e.g. to increase the use of energy-friendly vehicles, the EPA reports various sources of research on climate change and publicize them through various medias). Therefore, when designing the selling mechanism, the seller must consider the endogenous choice of buyer’s information structure by the third party. The third party can be interpreted as the “information designer” in the information design literature [Kamenica and Gentzkow, 2011], where an information designer commits to telling truth once the private signal is realized, but ex ante he can choose the distribution of the signal.

In this paper, I model explicitly what it means for a mechanism designer to design a game when there is unobservable information manipulation after the mechanism is chosen. In particular, I will characterize a “strong” revelation principle in the general setting. I will then specialize to the case of monopolistic pricing and use the revelation principle to characterize the optimal mechanisms chosen by the seller, as well as the equilibrium information structure of the buyer when the third party cares a weighted sum of the buyer’s and seller’s surplus. In particular, if the third party puts weakly higher weight on the seller’s surplus, the seller will always be able to get the highest surplus. If the third party cares only about the buyer’s surplus, full information is always provided, and the seller’s surplus is the lowest. For the cases when the third party puts positive but weakly smaller weight on the buyer’s surplus, I characterized the equilibrium outcomes and conducted comparative statics analysis. This
approach invokes no new primitives. Thus, it is a direct check of the robustness of traditional mechanism design results with respect to endogenous information manipulation.

Related to this paper, some recent work focused on robust mechanisms that implement a given outcome when the designer faces large uncertainty of the information structure, i.e. the designer is uncertain about agents’ beliefs, either about others’ private information or about others’ actions. [Bergemann and Morris, 2005], [Bergemann and Morris, 2013] and many other papers are in this direction. In these models, the information structure, although uncertain from the designer’s perspective, is still exogenous, and thus differs from the problem I am considering.

References


