

Full Surplus Extraction and Costless Information Revelation in Dynamic Environments

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In this paper, we study revenue maximizing mechanisms under dynamic information environments with discrete state spaces. Especially, we focus on mechanisms which extract the full surplus. In order to maximize the revenue, the mechanism designer may have to implement an inefficient allocation to reduce the information rent. However, if the mechanism designer can implement the efficient allocation rule without leaving any information rent to the agents, it is definitely the best outcome for the mechanism designer who wants to maximize his revenue.

Unfortunately, full surplus extraction is not always possible. In static environments, Crémer and McLean (1985, 1988) shed light on the necessary and sufficient condition for full surplus extraction. They proved that in static problems with private values, if the agents' private signals are mutually correlated (satisfy the *full rank condition*), the existence of a mechanism which extracts the whole surplus is guaranteed.

We established a dynamic counterpart of the 'full rank condition' which guarantees existence of a mechanism which extracts the whole surplus. Thanks to the richness of the environment, we can discard intractable *intratemporal probabilistic structure*, which is the key thing of the static Crémer-McLean mechanism. By abandoning it, we can make incentive compatibility more robust and tractable. Even after discarding intratemporal structure and requiring a stronger incentive condition, we can construct a mechanism which extracts the whole surplus from *intertemporal correlation* under generic assumptions.

In order to represent this idea formally, we introduce the *costless revelation condition* of the state transition structure. Intuitively, the costless revelation condition guarantees the possibility to construct a Crémer-McLean lottery which gives each agent (i) zero expected payoff if he reports the true state, and (ii) negative expected payoff if he misreports the state. Using this lottery, we can construct a payment rule which gives an incentive for truthful report, without leaving information rent.

If the efficient allocation itself is implementable by the other scheme, the costless revelation condition *in the initial period* guarantees that the mechanism designer can retrieve whole the surplus and incentive payment, so it is sufficient for full surplus extraction. If the costless revelation condition is satisfied throughout the time horizon, the state transition structure also guarantees implementability of the efficient allocation. Together with the extraction scheme described in the previous paragraph, we can characterize a sufficient condition for the state transition to guarantee the possibility of full surplus extraction.