

We consider the problem of minimizing social cost in atomic congestion games and show, perhaps surprisingly, that efficiently computed taxation mechanisms yield the same performance achievable by the best polynomial time algorithm, even when the latter has full control over the players' actions. It follows that no other tractable approach geared at incentivizing desirable system behavior can improve upon this result, regardless of whether it is based on taxations, coordination mechanisms, information provision, or any other principle.

Three technical contributions underpin this conclusion.

- First, we show that computing the minimum social cost is NP-hard to approximate within a given factor depending solely on the admissible resource costs.
- Second, we design a tractable taxation mechanism whose efficiency (price of anarchy) matches this hardness factor, and thus is optimal.
- As these results extend to coarse correlated equilibria, any no-regret algorithm inherits the same performances, allowing us to devise polynomial time algorithms with optimal approximation.  
(Joint work with Dario Paccagnan)