Noncooperative Games, Coupling Constraints, and Partial Efficiency

Restoring and Sharing Resource Rent

or: Mitigating the Tragedy of the Commons

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Abstract. Many noncooperative settings require sharing of aggregate holdings - be these of natural resources, production tasks, or pollution permits. This paper considers instances where the shared items eventually become competitively priced. For that reason, the solution concept incorporates features of Nash and Walras equilibria. Focus is on how the concerned agents, by themselves, may reach an outcome of such sort. A main mechanism is direct bilateral exchange, repeated time and again.

1. Extended Abstract

Social sciences increasingly recognize the importance of game theory, strategic behavior, and self-regarding agents. In most models, however, agents affect each other only through the objectives. No coupling constraints bear on individual strategies.

The games considered here are different; play affects objectives *and* constraints. Specifically, the parties share scarce resources. Thereby, constraints become coupled, in additive form. Amounts taken by any one agent subtract from what becomes available for others.

Yet, if the items shared are perfectly transferable, prospects seem good for some measure of partial efficiency. Indeed, when side payments facilitate transfers, the allocation stands good chances of becoming conditionally Pareto efficient. The reason is simple: unequal valuations encourage exchanges. Ultimately, after repeated transactions, if the personal values coincide, the noncooperative players see a cooperative solution to that segment of the game which relates to sharing. By the first welfare theorem, if parts of the game become competitive, these should yield conditional core outcomes, supported by prices.

How could such partially competitive equilibria be described and formalized? How might equilibrium be attained? Motivated by behavioral economics and dynamic interaction, these are the questions addressed.

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1