EQUILIBRIUM SELECTION AND THE RESTRICTED GAME

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1. Nash equilibria and basic noncooperative games. One of Nash's major contributions to game theory has been his concept of *equilibrium points* [N1], [N2], now usually described as *Nash equilibria.* They are a natural solution concept for noncooperative games in which

(a) the players use only *uncoordinated strategies* and expect the other players to do the same, and

(b) these players' behavior is guided by commonly agreed *objective probabilities.*

Such noncooperative games I shall call *basic games.*

What makes Nash equilibria a natural solution concept for basic games is the well-known fact that any prediction about the outcome of such a game will be automatically *self-defeating* if it predicts an outcome that is *not* a Nash equilibrium.[1]

2. The problem of equilibrium selection. Basic games give rise to the problem of *equilibrium selection.* Let me make the following two assumptions.

Assumption 1. The players of a given basic game G all *agree,* and *know* that they agree, in their desire to make the outcome of the game a *Nash equilibrium,* or even to make it a Nash equilibrium possessing some commonly agreed *special stability properties,* to be called an *eligible* Nash equilibrium.[2]

Assumption 2. Yet, this game G contains *two or more* different Nash equilibria satisfying the special eligibility criteria (if any) used by the players.

Given Assumptions 1 and 2, the problem of *equilibrium selection* will take the form of trying to find rational criteria enabling the players to select *one particular* eligible Nash equilibrium as the outcome of the game.

Definition 1. A (pure or mixed) strategy σ_i of any player i will be called an *eligible strategy* for the player if σ_i is the strategy that i would use *at least at one* eligible Nash equilibrium $\sigma = (\sigma_1, \ldots, \sigma_i, \ldots, \sigma_n)$ of this game G.

[1] As Aumann [A1], [A3] has shown (but see [A2]), proper analysis of *nonbasic* noncooperative games requires a more general equilibrium concept, that of *correlated equilibria* including ones based on *subjective probabilities.* In this paper, I discuss only *basic* noncooperative games.

[2] For instance, the players may want the outcome to be a Nash equilibrium that is both *proper* [M] and *persistent* [KS]. Of course, any number of alternative eligibility criteria might be used by the players.

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