Set of Correlated Equilibrium Payoffs is Convex

Proposition

Let $G = \{N, (A_i), (u_i)\}$ be a strategic game. Any convex combination of correlated equilibrium payoff profiles of G is a correlated equilibrium payoff profile of G.

- Let $u^1, \ldots, u^K$ be correlated equilibrium payoff profiles and let $(\lambda^1, \ldots, \lambda^K) \in \mathcal{R}^K$ with $\lambda^k \geq 0$ for all k and $\sum_{k=1}^K \lambda^k = 1$.
- For each k, $\{(\Omega^k, \pi^k), (\mathcal{P}_i^k), (\sigma_i^k)\}$ is the correlated equilibrium that generates u^k. (disjoint Ω^k)
- Let $\Omega = \cup_k \Omega^k$ and $\pi(\omega) = \lambda^k \pi^k(\omega)$ where k is such that $\omega \in \Omega^k$.
- For each i let $\mathcal{P}_i = \cup_k \mathcal{P}_i^k$.
- Let $\sigma_i(\omega) = \sigma_i^k(\omega)$ where k is such that $\omega \in \Omega^k$.