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On Strategic Complementarities in Discontinuous Games with Totally Ordered Strategies

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Abstract

This paper studies the existence of a pure strategy Nash equilibrium in games with strategic complementarities where the strategy sets are totally ordered. By relaxing the conventional conditions related to upper semicontinuity and single crossing, we enlarge the class of games to which monotone techniques are applicable. The results are illustrated with a number of economics-related examples.

Keywords:

Discontinuous game, Strategic complementarities, Better-reply security, Directional transfer single crossing, Increasing correspondence

1. Introduction

Upper semicontinuity, quasisupermodularity, and Milgrom and Shannon's (1994) single crossing are sufficient for a normal-form game where the strategy sets are compact lattices in Euclidean spaces to have a pure strategy Nash equilibrium.¹ In many economics-related games, the strategy sets are totally ordered. In such cases, both upper semicontinuity and single crossing are excessively demanding. The focus of this paper is on relaxing both of the two conditions.

In games with strategic complementarities, the best-reply correspondences are, usually, assumed to be nonempty-valued and subcomplete-sublattice-valued. These propitious properties of the best-reply correspondences are achieved by making a not entirely innocuous assumption, namely that each payoff function is upper semicontinuous in own strategy, which noticeably narrows the class of games in which equilibrium existence can be studied with the aid of lattice-theoretic tools. In this paper, upper semicontinuity is replaced with one of the following pairs of conditions: either with Tian and Zhou's (1995) transfer weak upper continuity and directional upper semicontinuity or with Reny's (1999) better-reply security and directional upper semicontinuity, thereby making it possible to cover new classes of games to which the seminal contributions by Vives (1990), Milgrom and Shannon (1994), and Reny (1999) cannot be applied.

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¹See, for general reviews, Vives (1999), Amir (2005), and Vives (2005).

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