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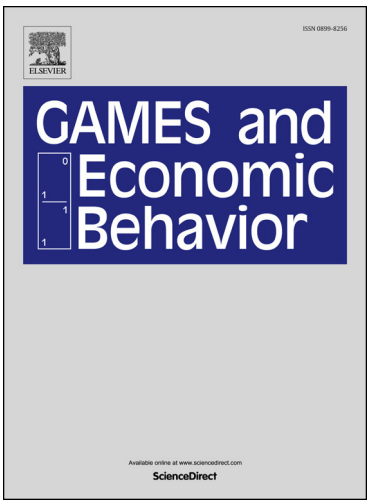

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ACCEPTED MANUSCRIPT

Games for Cautious Players: the Equilibrium in Secure Strategies

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Abstract

A non-cooperative solution, the Equilibrium in Secure Strategies (EinSS), is defined as an extension of the Nash equilibrium in pure strategies, and is meant to solve games where players are "cautious," *i.e.,* looking for secure positions and avoiding threats. This concept abstracts and unifies *ad hoc* solutions already formulated in various applied economic games that have been discussed extensively in the literature. A general existence theorem is provided and then applied to the price-setting game in the Hotelling location model, to Tullock's rent-seeking contests, and to Bertrand-Edgeworth duopoly. Finally, competition in the insurance market game is re-examined and the Rothchild-Stiglitz-Wilson contract is shown to be an EinSS even when the Nash equilibrium breaks down.

Keywords: Noncooperative games, Equilibrium existence, Equilibrium in secure strategies, Hotelling model, Tullock contest, Insurance market, Bertrand-Edgeworth duopoly

JEL classification: C72, D03, D43, D72, L12, L13

1. Introduction

There are well-known economic games where a Nash-Cournot equilibrium does not exist. Examples include the Bertrand-Edgeworth duopoly model[1], Hotelling's game of price competition on the line when the sellers locations are close[2], Tullock's rent-seeking game with the success function parameter greater than two[3], and Rothchild and Stiglitz's game of competitive insurance markets with adverse selection[4]. This existence problem was highlighted by Dasgupta and Maskin in their seminal paper (1986). They proved the existence of mixed strategy Nash equilibria for a family of games with discontinuous payoff functions covering all mentioned models. However, these equilibria are not easy to characterize in

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[1] Edgeworth (1925)
[2] Hotelling (1929), d'Aspremont *et al.* (1979).
[3] Tullock (1967, 1980) and Baye et al. (1994), for discussion and references.
[4] Rothchild and Stiglitz (1976), Wilson (1977).

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