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Three Essays in Game-theoretic Competition

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A thesis submitted in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

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Hong Kong Baptist University

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ABSTRACT

Different forms of competition arise in presence of different forms of scarce resources. Foraging as a dynamic biological competition, positioning as a sequential spatial competition, and an agrarian duopoly as a Stackelberg agrarian competition, are investigated in this dissertation, *Three Essays on Game Theory,* with a game-theoretic point of view. It consists of three chapters.

Chapter I, *Evolutionarily Stable Strategies in Dynamic Foraging,* presents a model of foraging as a simple non-cooperative dynamic game for biological resource with perfect and complete information. We extend Mazalov (1997) to the scenario for two animals of different foraging rates so as to differentiate intra- and inter-specific foraging behaviors. A novel solution is provided in explicit form. We also extend Mazalov (1997) to the scenario for N animals with consideration of time-consuming inter-patch movement so as to study intra-specific foraging behavior in large population. An implicit ESS solution is obtained. Emphasis is put on analysis of the situation of large population.

Chapter II, *Sequential Spatial Competition with Protection Barrier and Triggered Purchase Intention*, is a theoretical investigation of positioning as a sequential location game. We extend Prescott and Visscher (1977) to include protection barrier and triggered purchase intention, and to the positioning situation that the number of potential entrants is determined exogenously. We explore the details of optimal positioning study all the possible equilibria under various situations. The best response of players to suboptimal strategies of the previous players and positioning as a tool to deter new entry are investigated. Markets of horizontal spaces with and without extreme points are examined.

Chapter III, *Share Tenancy in a Two-landlord Duopoly,* is a theoretical exploration on share tenancy and other contractual forms of tenancies in an agrarian two-landlord duopoly as a Stackelberg agrarian game. We extend Yeung (2004) to the scenario of two-landlord duopoly. The efficiency and effectiveness of various forms of tenancies under different supply of land and farmers and under non-identical farmers are investigated. We examine under which situation various forms of tenancies coexist, under which situation a single form of tenancy predominates. Optimal forms of tenancies and the equilibria in the two-landlord economy are obtained. In particular, share tenancy is shown to be a form of price-discrimination even under a two-landlord duopoly.

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