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Second-mover advantage and price leadership in Bertrand duopoly

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Abstract

We consider the issue of first- versus second-mover advantage in differentiated-product Bertrand duopoly with general demand and asymmetric linear costs. We generalize existing results for all possible combinations where prices are either strategic substitutes and/or complements, dispensing with common extraneous and restrictive assumptions. We show that a firm with a sufficiently large cost lead over its rival has a first-mover advantage. For the linear version of the model, we invoke a natural endogenous timing scheme coupled with equilibrium selection according to risk dominance. The analysis yields, as the unique equilibrium outcome, sequential play with the low-cost firm as leader.

JEL classification: L13; C72; D43

Keywords: Price competition; Endogenous timing; First/second-mover advantage; Risk dominance

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1. Introduction

The classical issue in traditional oligopoly theory dealing with the appropriateness of the equilibrium concept, Cournot–Nash or Stackelberg, in various imperfectly competitive settings has enjoyed a major revival over the last fifteen years. This revival consists of two main strands of research with some overlap. The first deals with the determination of first- and second-mover advantages in given subclasses of the general class of duopoly games characterized by monotone best-responses (upward- or downward-sloping), and monotone profits in rival's actions. In other words, this strand compares the equilibrium payoffs of the two firms in the two sequential games of perfect information obtained by considering both orders of moves. This strand includes[1] Gal-Or (1985) and Dowrick (1986).

The second strand of research deals with the issue of endogenous timing. Its guiding premise is that in duopoly models the determination of simultaneity versus sequentiality of moves, as well as of the assignment of roles to the players in the latter case, should be completely endogenous. In other words, the order of play in a given two-player game ought to reflect the players' own intrinsic incentives, in the absence of any natural exogenously determined timing structure (Hamilton and Slutsky, 1990; Amir, 1995).[2]

The present paper relates to both strands and deals with duopoly price competition with differentiated products and constant unit costs.[3] It is widely believed that price competition is typically characterized by a second-mover advantage. As Bertrand's classical critique of Cournot shows, this intuition certainly holds in an extreme form in the case of homogeneous products, owing to the totally discontinuous nature of each firm's demand along the price diagonal. Furthermore, this intuition has also been strongly reinforced by the well-known result that, even with differentiated-products, a second-mover advantage prevails when firms are identical, under quite general conditions (see, e.g., Gal-Or, 1985).

The present paper has two related objectives. Firstly, we generalize the well-known results in the literature on first/second-mover advantage in price competition with constant unit costs, by removing the common (sometimes tacit) assumptions of concavity of profits in own action (or continuity and single-valuedness of the reaction curves), and of existence and uniqueness of the Bertrand equilibrium. To do so, we invoke the recent results of supermodular optimization/games.[4] In the process, we also clarify the crucial role played by the strategic complementarity or substitutability of prices in determining timing advantage in price competition with asymmetric firms. To this end, we consider all three possible cases that can arise, making minimal assumptions on primitives leading to each case. We prove that when both optimal reactions slope upwards, at least one firm has a second-mover

[1] Mailath (1993) and Daughety and Reinganum (1994), among others, have signalling frameworks, thus adding an informational trade-off to the leader–follower roles.

[2] Studies with specific oligopolistic settings are numerous; they include Boyer and Moreaux (1987), Robson (1990), Deneckere and Kovenock (1992), Leininger (1993), Anderson and Engers (1992), van Damme and Hurkens (1999, 2004), Pastine and Pastine (2004), Amir and Grilo (1999), and Amir et al. (1999), among others. Studies dealing with abstract game formulations include d'Aspremont and Gerard-Varet (1980), Rosenthal (1991), van Damme and Hurkens (1996), and von Stengel (2003).

[3] Price leadership in the form of a dominant firm has been an extensively investigated topic by early oligopoly theorists, see, e.g., Stigler (1947) and Markham (1951).

[4] See Topkis (1978), Vives (1990), and Milgrom and Roberts (1990), among others.