Leadership and demand uncertainty

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Abstract

We give some new contributions to answer the following question: Do first movers really have strategic advantage in practice? The belief of first-mover advantage was widely held among entrepreneurs and venture capitalists, but is now questioned by numerous practitioners. The probability of success of pioneering in a market clearly depends on many factors, including technology, marketing strategy, market demand and product differentiation. We extend Liu's [3] results by focus not only on the effects of the market demand uncertainty, but also on product differentiation and on the 'own' price effect, to explain the advantages and disadvantages of being the leading firm. Usually, the followers in markets get more market information than first movers before sinking their investments. In some industries that we consider to have fairly stable and predictable market demand, the pioneering firm tends to be the biggest player. However, if a market has a high degree of uncertainty, the followers can wait and see the customers' response to the new product introduced by the first movers, as well as move along the "differentiation curve" of innovation. As in Liu's [3] model, we consider that only the first mover (leading firm) faces demand uncertainty. The demand uncertainty is given by a random variable uniformly distributed, with mean μ and standard deviation σ characterizing the *demand uncertainty parameter* $\theta = (\mu + \sqrt{3}\sigma)/(\mu - \sqrt{3}\sigma)$. By the time the second mover chooses its output level, that uncertainty is resolved. Therefore, the leading firm possesses first-mover advantage,

but the second mover enjoys an informational advantage because it can adjust the production level after observing the realized demand (flexibility). We study the advantages of flexibility over leadership as the degree $0 < \gamma \leq 1$ of the differentiation of the goods changes, where γ attains the value 1, if the goods are homogeneous, and tends to 0, if the goods are close to independent goods. We find explicit functions I_γ and J_γ, in terms of the degree of differentiation, characterizing the demand uncertainty parameter θ for which the leading firm looses its advantage for some realizations of the demand random variable. We show that the leading firm looses its advantage for high values of the demand intercept, if the demand uncertainty parameter θ is greater than I_γ, and for low values of the demand intercept, if the demand uncertainty parameter θ is greater than J_γ. Hence, for high values of the demand uncertainty parameter θ only in an intermediate zone of the realized demand does the first mover preserve its advantage. We make an ex-ante analysis by computing the expected value, with respect to the demand realization α, of the profits of both firms in terms of the demand uncertainty parameter θ and of the degree γ of product differentiation. In particular, we prove that, even in the presence of low uncertainty, the expected value of the profit of the second firm increases to higher values than the ones of the leading firm with the increase of the product differentiation. Moreover, we show that there is a value θ_0 such that if the uncertainty parameter θ is greater than θ_0, then the expected profit of the follower firm is always greater than the expected profit of the leading firm. We also make an ex-post analysis by computing and comparing the firms' profits after the demand uncertainty has been resolved. We also compute the probability $P(\pi_2^* > \pi_1^*)$ of the second firm to have higher profit than the leading firm in terms of the demand uncertainty parameter and of the product differentiation.

Keywords: Stackelberg model; Demand uncertainty; Product differentiation.
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