Imperfect price discrimination in a vertical differentiation model

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Abstract

We explore the competitive implications of third-degree price discrimination based on consumer information of varying degrees of "precision" in a vertical differentiation duopoly model. We show that, if the cost of information is below a threshold, only the high quality firm will acquire it and offer targeted promotions, while the low quality firm will commit to a uniform price, for any degree of consumer information precision. Equilibrium profits of the high quality firm are monotonically increasing and that of the low quality firm monotonically decreasing as a function of the consumer information precision. Finally, social and consumer welfare are monotonically increasing with respect to the precision of consumer information.
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1. Introduction

The rapid development of the Internet as a medium of communication and commerce has prompted many marketers and retailers to accumulate a large amount of customer-specific information. Firms analyze the available information with the aid of sophisticated software tools and segment their customers according to certain verifiable characteristics such as age, income, place of residence, browsing patterns and past purchasing behavior. Consumer segmentation, in turn, helps firms tailor their promotional strategies, depending upon each group's preferences for a firm's brand. For example, different segments can receive a different quality of service or different discounts.[2] How refined customer segmentation is, depends critically on the quality and quantity of customer-specific information that a firm has acquired. The continuing growth of information technology (IT) has clearly had a positive impact on the ability of customer databases to predict consumer preferences more accurately.

We formulate a model of oligopolistic third-degree price discrimination with one high and one low quality firm (vertical differentiation). Consumer information partitions the characteristics space, allowing firms to classify the consumers into different segments by imperfectly estimating the brand premium each consumer is willing to pay for the high quality product. Firms can then tailor their prices to each consumer segment. Higher information precision is modeled as a refinement of the partition. We address the following questions: (i) Does the high quality firm have the stronger incentive to acquire information and price discriminate? (ii) How does the precision of the available information affect product quality? (iii) How do firms' incentives for information acquisition, profits and welfare evolve as information precision improves?

The literature on oligopolistic third-degree price discrimination in location models can be roughly divided into two strands.[3] The first strand assumes symmetric firms with the ability to segment consumers either into two groups or perfectly.[4] A common thread in those papers is that profits under price discrimination fall short of those under a uniform pricing rule. The second strand deals with asymmetric firms but maintains the assumption that firms can classify the consumers either into two groups or perfectly.[5] Corts shows that in a duopoly model of vertical differentiation, price discrimination between two groups of consumers leads to lower profits for *both* firms. Thisse and Vives develop a perfect price discrimination model and assume that one firm has a cost advantage over the other. They show that, in a dominant strategy equilibrium, both firms will choose to price discriminate.

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[2] There are many examples of firms that segment consumers into groups based on observable characteristics and offer a different price to each group. Dell, for example, follows this practice. According to the June 8, 2001 *Wall Street Journal*: "One day recently, the Dell Latitude L400 ultralight laptop was listed at $2307 on the company's Web page catering to small businesses. On the Web page for sales to health-care companies, the same machine was listed at $2228, or 3% less. For state and local governments, it was priced at $2072.04, or 10% less than the price for small businesses".

[3] For a comprehensive survey on the price discrimination literature see Stole (2003).

[4] See, for example, Bester and Petrakis (1996), Chen (1997), Fudenberg and Tirole (2000) and Shaffer and Zhang (1995).

[5] See, for example, Anderson and de Palma (1988), Corts (1998), Lederer and Hurter (1986), Rao (1991), Shaffer and Zhang (2000, 2002) and Thisse and Vives (1988).