Location Choices under Price Discrimination with Partial Information

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This paper investigates the effects of competitive price discrimination in the spatial location decision of firms in a two-dimensional product differentiation model. We suppose that there are two firms offering a product which is differentiated according to two characteristics. Thus, each firm chooses a location in the square $[0,1]^2$. Firm's A location is described by a vector $A = (a_1, a_2)$, and firm's B location is described by a vector $B = (b_1, b_2)$. Without loss of generality, assume that $a_1 \leq b_1$ and $a_2 \leq b_2$. Consumers are uniformly distributed in the square $[0,1]^2$ and a consumer's location (or his preference) is described by the vector $X = (x_1, x_2)$, $X \in [0,1]^2$. The total number of consumers is normalised to one, and each consumer wishes to buy a single unit either from firm A or B. The consumer valuation for the product, v, is sufficiently high so that nobody stays out of the market. Firms have the same constant marginal costs, c, nomalized to 0, with no loss of generality. As usual in models with endogenous location choices we assume that transportation costs are quadratic. Consumers incur a transportation cost $t_i, i = 1,2$ per unit of length in dimension i. Thus, with quadratic transportation costs a consumer at X incurs a transportation cost of $t_1 x_1 + t_2 x_2$ when buying variant A, and a transportation cost of $t_1(1 - x_1)^2 + t_2(1 - x_2)^2$ when buying variant B.

We assume that firms play a two-period game. In the first period firms decide where to locate in the square. In the second-period, after location choices have been made, firms compete in prices. If firms have no information about consumer's preferences (i.e., their location) they compete in uniform prices. Otherwise, if firms have information about each consumer's preferences they may engage in price discrimination in period 2. Two settings are presented. The first setting, the benchmark case with no discrimination, is a

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special case of Tabuchi (1994) and Thisse and Irmen (1998) as we investigate the firms' location choices when they know nothing about consumers' preferences. The second setting, assumes that firms have partial information about consumers' preferences (i.e., they observe each consumer's location in just one dimension). Thus, in period 2 they can engage in price discrimination based on partial information. The second-period pricing game is a special case of Esteves (2009). This second framework allows us to investigate the firms' location choices under price discrimination in period 2.

In the no-discrimination case we show that firms choose maximal differentiation in the dominant characteristic and no differentiation in the other one. In contrast, when firms have information to engage in partial price discrimination in the second stage of the game, we show that firms choose maximal differentiation with respect to the non-discriminating characteristic and minimal differentiation with respect to the non-discriminating characteristic.