



Should a firm engage in behaviour-based price discrimination when facing a price discriminating rival? A game-theory analysis



Stefano Colombo

Università Cattolica del Sacro Cuore, Department of Economics and Finance, Milano, Italy

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ABSTRACT

This article analyses the pricing policy equilibria emerging in a duopoly when one firm may choose whether to engage in behaviour-based price discrimination or uniform pricing while the rival price discriminates. The question we address is: should a firm price discriminate when facing a price discriminating rival? Our main conclusion is that, if the consumers are sufficiently myopic, it is better to choose uniform pricing instead of price discrimination. This is in contrast with the consensus reached in classic price discrimination theory, and it shows that it may be better for a firm to unilaterally renounce to price flexibility when facing a flexible firm.

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1. Introduction

Behaviour-based price discrimination (BBPD) has become a common practice among firms. Basically, BBPD is a peculiar form of price discrimination consisting in setting different prices to consumers who have different past purchase histories. The existence and the adoption of sophisticated techniques aimed at gathering and using information about consumers' purchase histories have dramatically improved the ability of firms to target the price to "old" consumers and "new" consumers. Nowadays, BBPD is adopted in many industries, including banks, airlines, software and the energy industry. Furthermore, as pointed out by De Nijs (2013), "there are now many examples of behaviour-based pricing on the Internet" (p. 32).

The present article considers the pricing policy choice of a firm facing a rival who adopts behaviour-based price

discrimination. Which strategy should the firm adopt? Should it gather information about consumers in such a way to engage in BBPD as the rival, or should it adopt uniform pricing? A recent work by Chen and Iyer (2002) provides a clear description of the problem. The authors provide evidence of the effort of firms to acquire from external sources or to develop from themselves an information technology that can be used to distinguish across consumers (see also Liu and Serfes, 2004, for a similar debate). The simplest distinction across consumers considers the identity of the firm from which a consumer has bought in the past: a consumer that has bought from firm A is distinguished from a consumer that has bought from firm B. Suppose now that one firm which is already active in the market owns the information technology imagined by Chen and Iyer (2002): the firm is able to distinguish across consumers that have different purchasing histories. For example, Chen and Iyer (2002) document how the bank card receivable company First USA signed agreements with

E-mail address: stefano.colombo@unicatt.it

large search engine companies in order to be able to discriminate across consumers. In a case like this, a costless drop by First USA from the *ability* to price discriminate would not be possible. Of course, the ability to price discriminate across consumers on the basis of their past purchases does not imply that the firm is forced to make use of this ability, that is, a firm which is able to price discriminate is also able to price uniformly (whereas the reverse is not true). However, as it shall be clear from the following analysis, once a firm has the ability to price discriminate, it is always optimal for it to make use of such ability. Suppose now that another firm enters into the market. Should the new-comer buy the information technology too in order to compete vis-à-vis with the incumbent or should it refuse to buy? At a first look, one might be tempted to think that buying without costs a technology that allows a better targeting of consumers should always be optimal for the new-comer. Indeed, why a firm should deprive itself from a marketing weapon at the disposal of the rival? After all, this is also the conclusion already reached by scholars in the case of “classic” price discrimination.¹ As [Thisse and Vives \(1988\)](#) show in their seminal paper, and as many other contributions have subsequently confirmed (see [Armstrong, 2008](#), for an updated review), the dominant strategy of each firm consists in choosing price discrimination, as this guarantees higher flexibility in setting prices.

Quite surprisingly, the conclusions in the case of BBPD are definitely less obvious. Indeed, we show that the profit-maximizing solution for a firm facing a price discriminating rival may be committing to uniform pricing. That is, even if the information technology that allows price discrimination is available at zero costs, the firm, under some conditions, may prefer not to buy the technology. Such difference with respect to the case of classic price discrimination is due to the dynamic nature of BBPD in contrast to the static nature of classic price discrimination. Indeed, when the consumers are sufficiently myopic and/or firms are sufficiently forward-looking, committing to uniform pricing allows to reduce the demand elasticity and to get higher profits, even if the commitment not to discriminate impedes the firm to be as flexible as its rival. In a static framework, this elasticity effect is absent, and only flexibility matters. Therefore, in the case of classic price discrimination, the choosing firm always prefers to price discriminate.

Behaviour-based price discrimination has been studied under several aspects.² Among the others, [Villas-Boas \(1999, 2004\)](#) adopts an infinite-horizon duopoly market with overlapping generations of consumers, and shows that BBPD hurts firms when consumers are patient, whereas [Fudenberg and Tirole \(2000\)](#), in a two-period model with no switching costs, show that BBPD hurts the firms in the second period, but benefits them in the first period. When

switching costs exist, [Chen \(1997\)](#) shows that, as a result of the incentive of each firm to pay the consumers to switch, the overall profits are lower under BBPD. [Taylor \(2003\)](#) extends Chen’s model to a multi-period and multi-firms set up, and confirms that BBPD has a negative effect on firms’ profits. Our article is also related to those articles that analyse BBPD within *asymmetric* contexts. [Shaffer and Zhang \(2000\)](#) consider two firms that have a different initial market share: depending on the degree of asymmetry between the market shares, price discrimination may benefit one or both firms. In the same research line, [Chen \(2008\)](#) shows in a dynamic model that an incumbent that is able to behaviour-based price discriminate may use this capability to prey on a small potential entrant.³

We consider a duopoly model where one firm is adopting BBPD, while another firm is free to adopt BBPD or not. After the pricing policy choice, the two firms compete for two periods accordingly to their own pricing policy. The degree of consumer myopia is kept general, ranging from total myopia to perfect long-sightedness. Furthermore, the consumers pay switching costs when they buy from different firms in the two periods. In such context, we show that both a symmetric pricing policy equilibrium where both firms engage in BBPD and an asymmetric pricing policy equilibrium where the choosing firm commits to uniform pricing are possible. In particular, one of the results of this article is the following: the more the consumers are myopic, the more likely is the asymmetric pricing policy equilibrium. The basic intuition is the following. When all firms adopt BBPD, the more the consumers are forward-looking the lower the demand elasticity is [Fudenberg and Tirole \(2000\)](#). On the other hand, when firms adopt different pricing policies, we show that the degree of long-sightedness has an opposite impact on demand elasticity: now, the more the consumers are forward-looking, the *higher* the demand elasticity is. Therefore, depending on the level of consumer myopia, the incentive of the firm to adopt BBPD changes: when the consumers are highly forward-looking, the incentive to adopt BBPD is high relative to the incentive to adopt uniform pricing, whereas the opposite holds when consumers are highly myopic. We also study the impact of switching costs, and we show that higher switching costs enlarge the parameter space under which the asymmetric pricing policy equilibrium emerges: this result depends on the fact that when the switching costs are high the firm might reduce first-period price competition by choosing uniform pricing.⁴ We also discuss the case where the two firms have different marginal costs. We show that the more efficient the choosing firm with respect to the rival is, the larger

¹ By “classic” price discrimination we refer to the case where firms are able to distinguish across consumers by inspecting directly their characteristics, whereas in behaviour-based price discrimination the consumers indirectly reveal their preferences through their past behaviours.

² [Fudenberg and Villas-Boas \(2007\)](#) and [Esteves \(2009\)](#) contain updated reviews of BBPD literature. From an empirical perspective, [Rossi et al. \(1996\)](#) and [Besanko et al. \(2003\)](#) are relevant contributions.

³ Other contributions less close to the present work consider BBPD when the consumer preferences vary across periods ([Shin and Sudhir, 2010](#)), when a discrete distribution of consumers and mixed equilibrium strategies are considered ([Esteves, 2010](#)), when loyalty rewards are taken into account ([Caminal and Matutes, 1990](#), and [Caillaud and De Nijs, 2014](#)) and when there is asymmetric inherited market dominance ([Gehrig et al., 2012](#)).

⁴ One may think that switching costs, by locking-in the consumers, increase the incentive to engage in BBPD. However, the higher the switching costs are, the fiercer is first-period competition, and this may lead the firm to choose uniform pricing rather than price discrimination.

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