

HISTORY-BASED PRICE DISCRIMINATION AND ENTRY IN MARKETS WITH SWITCHING COSTS: A WELFARE ANALYSIS*

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Abstract

We analyze history-based price discrimination in an asymmetric industry, where an incumbent, protected by switching costs, faces an entrant who does not have access to information about consumers' purchase histories. We demonstrate that consumer surplus is higher with uniform pricing than with history-based price discrimination. We find that the entry decision is invariant to whether the incumbent implements history-based pricing or uniform pricing. This implies that the potential abuse of market dominance imposed by history-based price discrimination is exploitation, not exclusion. Finally, we establish that the profit gain to the incumbent from history-based pricing exceeds the associated loss to consumers.

Keywords: History-based Pricing, Price Discrimination, Entry, Switching Costs, Abuse of Market Dominance, Exclusionary Abuse, Exploitative Abuse, Ban on Price Discrimination.

JEL Classification Numbers: D4, L1, L41.

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1. Introduction

Business practices with prices set on the basis of observed customer purchasing behavior are now widely observed. It has become common in, for example, telecommunication, service industries and energy markets to differentiate the prices directed to old and new customers. Typically new customers are targeted by aggressive price offers (introductory offers or poaching), which are designed to attract new customers or to induce rival firms' customers to switch even when those customers are already locked-in in another customer relationship. This form of competition is one manifestation of history-based pricing. In this study we will explore the antitrust implications of history-based pricing by focusing on the following questions: Can history-based pricing be viewed as an instrument for a dominant firm to induce exclusion of a potential entrant? Does it prevent consumers from enjoying the benefits of competition? Does history-based pricing make dominance persistent? What is precisely the relationship between history-based pricing and uniform pricing by an incumbent firm? Which are the effects of history-based pricing for consumers?

A number of European antitrust cases have established how history-based price discrimination might facilitate predation in a way which would, according to competition authorities or courts, qualify as an abuse of a dominant market position. The seminal case exemplifying this is the ECS-AKZO case¹ where AKZO targeted selective price cuts to ECS's customers with the intention of excluding ECS from the market. According to the decision of the European Commission "the anti-competitive effect of AKZO's differential pricing involved not so much indirect injury to customers but rather a serious impact on the structure of competition at the level of supply by reason of its exclusionary effect" (Section 83 of the European Commission's Decision on the ECS/AKZO case).² Another example is the Irish Sugar case, where the Commission fined Irish Sugar in 1997 for abuse of its dominant position in the national sugar market. The fined corporation applied a scheme of target rebates such that the rebate was more favorable to particular customers of competing sugar packers. This ruling was upheld by the European Court of First Instance in the case *Irish Sugar vs. Commission*, where the Court supported the Commission's finding that the selective price cut by Irish Sugar to its rival's customers, had it been proven, would have been considered an abuse of a dominant position. For a more extensive and systematic account of European competition law towards price discrimination we refer to Geradin and Petit (2005).

¹European Commission Decision 85/609 of 14 December 1985, ECS/Akzo, OJ L 374 of 31 December 1985, 1–27.

²The ECS/AKZO case actually exemplifies how price discrimination may facilitate predation. Spector (2005) presents a more thorough discussion of this aspect.

The Swedish Competition Authority vs. TeliaSonera is a national competition case from year 2005 illustrating how selective poaching offers by a dominant firm to a small rival's customers may qualify as an abuse of market dominance. This case focuses on fixed line telecommunications as the relevant market, where TeliaSonera had a dominant position in the Swedish market. In this case TeliaSonera directed selective poaching offers exclusively to customers of Bredbandsbolaget, a small regional rival.³

In this study we analyze the effects of history-based price discrimination in an asymmetric industry, where an incumbent, protected by switching costs, faces an entrant who does not have access to information about consumers' purchase histories. As for the effects on market shares we find the persistence of market dominance for an incumbent firm to be invariant across the regimes with history-based pricing and uniform pricing. Nevertheless, consumers would benefit from a policy which bans history-based price discrimination insofar as consumer surplus is higher with uniform pricing than with history-based pricing. According to our analysis, the entry decision of a firm introducing a competing brand is invariant to whether the incumbent firm implements history-based pricing or uniform pricing. This result has strong implications for the implementation of Article 82 in Europe. It implies that the potential abuse of consumers imposed by history-based price discrimination is exploitation, not exclusion. Finally, we establish that history-based price discrimination benefits society in the sense that the profit gain from history-based pricing to the incumbent exceeds the associated loss to consumers.

An important sequence of studies has earlier explored the effects of price discrimination across separated markets on entry and welfare. Armstrong and Vickers (1993) focused on a framework where the incumbent firm operates in an exogenously determined sheltered segment as well as a segment subject to potential competition, and they found that price discrimination across markets tends to discourage entry. Cheung and Wang (1999) extended this approach in certain respects and found that price discrimination across markets may encourage or discourage entry, depending on the price elasticity of the competitive market and that of the captive market. This approach has been further developed by Jorge and Pires (2007). Armstrong (2008) and Motta (2004, section 7.4) present general perspectives on this literature. Bouckaert, Degryse and van Dijk (2007) have extended the analysis of the effects of price discrimination across separated markets in a two-period framework. Chen (2008) also analyses history-based pricing in asymmetric duopoly and its

³Stockholm District Court Case 28 October 2005 Dnr 873/2005. Subsequently the Swedish Competition Authority withdrew the case from the Market Court because the case could not be supported by convincing empirical evidence.

implications for consumer surplus. While his focus is on exclusionary practices by the dominant firm in order to induce exit, we focus on market entry in a setting of extreme initial asymmetry.⁴

The studies mentioned above all focus on price discrimination within a framework where the dominant firm operates in an exogenously determined sheltered segment as well as a segment subject to competition. Contrary to these approaches, we explore the consequences of history-based price discrimination within a framework where the loyal segment of a dominant firm is endogenously determined. Contrary to these studies we design a model focusing exclusively on history-based price discrimination within one market. This means, in particular, that the loyal segment of the dominant firm is determined endogenously.

Our study is structured as follows: Section 2 presents a model of history-based price discrimination and entry. It also explores the effects of history-based pricing on market shares. Section 3 analyzes the similar market configuration for the case in which the incumbent is restricted to charge a uniform price to all buyers. Section 4 investigates the implications of history-based pricing on consumer surplus, profits of the incumbent and the entrant, and total welfare. Section 5 concludes.

2. Entry and History-based Pricing

Consider a horizontally differentiated industry where an incumbent firm, firm A , is challenged by an entrant, firm B . Assume that the incumbent inherits a monopoly position in a horizontally differentiated Hotelling market with full market coverage. Assume, for simplicity, that consumers are uniformly distributed on the interval $[0, 1]$. Suppose that a proportion θ of the consumers are replaced by a new cohort, which is also uniformly distributed on $[0, 1]$. The incumbent can distinguish surviving inherited customers from newly-born customers and based on that distinction it can implement history-based (history-based) price discrimination. The entrant has access to no customer history and therefore cannot price discriminate across consumer generations.

Firm A (B) is located on the left (right) side of the unit interval. Consumers are distributed on the the unit interval according to increased preference for brand B (decreased preference for A). All consumers, both old and new ones, each buy one unit of the differentiated good from one of the firms. Firm A 's and B 's marginal production costs are denoted by c_A and c_B . We introduce the terminology $\Delta c \stackrel{\text{def}}{=} c_A - c_B$ to capture the efficiency differential between firm A and firm B . Thus, $\Delta c > 0$ means that firm B has a production cost advantage relative to firm A . We assume that

⁴For more comments on the relationship between Chen (2008) and our study see a discussion in the conclusion.

there are neither fixed costs nor entry costs. Let p_A denote the price firm A sets for consumers who have already purchased brand A before, and q_A the price for new consumers. We refer to p_A as the price for *loyal* customers. Firm B has access to no purchase history and therefore cannot distinguish between old and new consumers. Hence firm B must charge a uniform price p_B to all consumers.

The firms compete in two different market segments. (a) The market segment for “old” consumers (the proportion $1 - \theta$) and (b) the market segment for “new” consumers (the proportion θ). The incumbent has a strategic advantage based on switching costs in the market segment for old consumers. More precisely, old consumers face an exogenous switching cost σ if they switch from brand A to brand B . This switching cost defines the incumbency advantage, or equivalently the entrant’s disadvantage. The utility of an old consumer indexed by x is defined by

$$U(x) = \begin{cases} \beta - p_A - \tau x & \text{if continues to purchase brand } A \\ \beta - p_B - \tau(1 - x) - \sigma & \text{now switches to brand } B. \end{cases} \quad (1)$$

The utility function of a new consumer indexed by x is

$$V(x) = \begin{cases} \beta - q_A - \tau x & \text{if buys brand } A \\ \beta - p_B - \tau(1 - x) & \text{if buys brand } B. \end{cases} \quad (2)$$

Figure 1 illustrates the allocation of old and new consumers between the two brands.

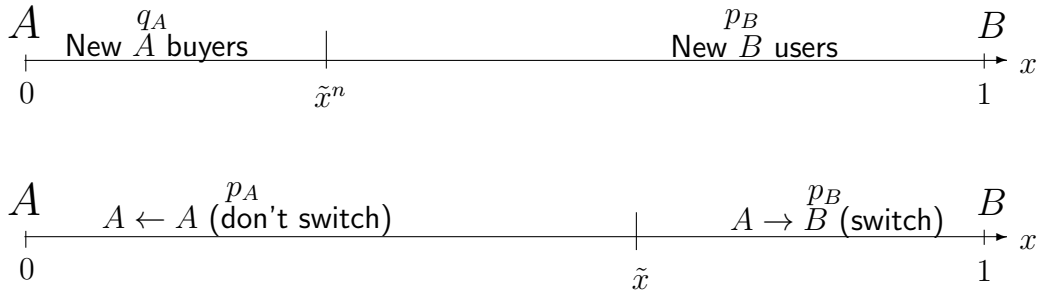


Figure 1: Consumer allocation between horizontally-differentiated brands. *Bottom:* $(1 - \theta)$ old consumers. *Top:* θ new consumers.

Firm A sets a price p_A to its loyal customers, and q_A to new consumers. Firm B cannot distinguish among consumers, so it sets a single price p_B to all consumers (new consumers and consumers who switch from A). Let \tilde{x}^n denote a new consumer who is indifferent between purchasing A and B . This consumer is determined from $\beta - q_A - \tau\tilde{x}^n = \beta - p_B - \tau(1 - \tilde{x}^n)$. Let \tilde{x} denote an old consumer who is indifferent between being loyal to A and switching to the new brand B . This consumer is determined from $\beta - p_A - \tau\tilde{x} = \beta - p_B - \tau(1 - \tilde{x}) - \sigma$. Therefore,

$$\tilde{x}^n = \frac{1}{2} + \frac{p_B - q_A}{2\tau} \quad \text{and} \quad \tilde{x} = \frac{1}{2} + \frac{\sigma + p_B - p_A}{2\tau}. \quad (3)$$

Firm A chooses prices p_A and q_A to maximize $\pi_A = (q_A - c_A)\theta\tilde{x}^n + (p_A - c_A)(1 - \theta)\tilde{x}$. Firm B chooses a single price p_B to maximize $\pi_B = (p_B - c_B)[\theta(1 - \tilde{x}^n) + (1 - \theta)(1 - \tilde{x})]$. The uniquely-determined equilibrium prices are

$$p_A^d = \tau + \frac{(2 + \theta)\sigma + 4c_A + 2c_B}{6}, \quad q_A^d = \tau + \frac{4c_A + 2c_B - (1 - \theta)\sigma}{6},$$

$$\text{and } p_B^d = \tau + \frac{2c_B + c_A - (1 - \theta)\sigma}{3}. \quad (4)$$

From (4) we can conclude that the relationship between the equilibrium prices depends on the switching cost and the relative efficiencies between the firms. In line with intuition, in equilibrium firm A 's loyalty price p_A^d increases the switching cost σ , whereas the price to new consumers q_A^d decreases with the switching cost. Similarly, an increased switching cost means that firm B has to price more aggressively to attract consumers and therefore the equilibrium price p_B is a decreasing function of σ . By comparison of the equilibrium prices we find that $p_A^d > q_A^d > p_B^d$ if $\Delta c > -(1 - \theta)\sigma$. This holds true, in particular, if the firms are equally efficient, i.e., if $\Delta c = 0$. Analogously, $p_A^d > p_B^d > q_A^d$ if $\Delta c < -(1 - \theta)\sigma$. Substituting the equilibrium prices (4) into (3) obtains the incumbent's equilibrium market share among all consumers. Thus,

$$\tilde{x} = \frac{1}{2} + \frac{(2 + \theta)\sigma - 2\Delta c}{12\tau}, \quad \tilde{x}^n = \frac{1}{2} - \frac{(1 - \theta)\sigma + 2\Delta c}{12\tau},$$

$$\text{and } m_A^d = \theta\tilde{x}^n + (1 - \theta)\tilde{x} = \frac{1}{2} + \frac{(1 - \theta)\sigma - \Delta c}{6\tau}. \quad (5)$$

From (5) we can directly formulate the following result.

Result 1. *If $\sigma > \Delta c / (1 - \theta)$, an incumbent applying history-based price discrimination can maintain market dominance ($m_A^d > 1/2$) despite entry.*

From Result 1 we can draw a number of significant and interesting conclusions. Firstly, if the incumbent is more efficient than the entrant ($\Delta c < 0$) dominance will always persist in the sense that the entrant will be unable to achieve a 50% market share. This is a natural result and under such circumstances the persistence of dominance does not seem to pose serious antitrust concerns. Secondly, when the firms are equally efficient ($\Delta c = 0$) the incumbent is able to defend its dominance through the use of history-based price discrimination as long as it is protected by some level of switching costs. Thirdly, and perhaps most interestingly, even when facing a more efficient entrant ($\Delta c < 0$) an incumbent protected by sufficiently strong switching costs can maintain dominance through the use of history-based price discrimination.

It should be emphasized that the persistence of dominance for an incumbent is here discussed in the absence of any sunk entry costs for the entrant. To the extent there are sunk entry costs the risks for exclusionary effects of history-based price discrimination are higher than what an analysis with such costs excluded would indicate. In any case, Result 1 is very interesting when evaluating whether history-based price discrimination could qualify as an abuse of a dominant position in light of the “as efficient competitor”-test, which is sometimes advocated by the European Commission.⁵

3. Entry Under Uniform pricing

An evaluation of history-based price discrimination has to be based on a comparison with uniform pricing. Suppose therefore now that the incumbent firm A cannot price discriminate between its loyal consumers and new consumers. Formally, let $p_A = q_A$. Re-computing the price equilibrium (p_A^u, p_B^u) subject to the restriction that the incumbent operates with a uniform price precisely like the entrant we find that

$$\begin{aligned}
 p_A^u = q_A^u = \tau + \frac{2c_A + c_B + (1 - \theta)\sigma}{3}, \quad p_B^u = \tau + \frac{2c_B + c_A - (1 - \theta)\sigma}{3}, \\
 \tilde{x}^u = \frac{1}{2} + \frac{(2\theta + 1)\sigma - \Delta c}{6\tau}, \quad x_n^u = \frac{1}{2} - \frac{\Delta c + 2(1 - \theta)\sigma}{6\tau}, \\
 \text{and } m_A^u = \theta x_n^u + (1 - \theta)\tilde{x}^u = \frac{1}{2} + \frac{(1 - \theta)\sigma - \Delta c}{6\tau} > \frac{1}{2}. \quad (6)
 \end{aligned}$$

Comparing (5) with (6) we can draw the following conclusion.

Result 2. *The persistence of market dominance for an incumbent firm is invariant across the regimes with history-based pricing and uniform pricing.*

Result 2 means that an incumbent applying history-based price discrimination can defend market dominance precisely under the same circumstances when this incumbent can maintain dominance if restricted to uniform pricing. In this respect history-based price discrimination does not promote the persistence of an incumbent's dominance.⁶ As far as market shares are concerned we can conclude

⁵For example, in its Guidance on the enforcement priorities in applying Article 82 to abusive exclusionary conduct in December 2008 the European Commission (see, http://ec.europa.eu/competition/antitrust/art82/guidance_en.pdf) evaluates some business practices against the criterion that only conduct which would exclude a hypothetical “as efficient” competitor would be abusive.

⁶Here we take persistence of dominance to simply mean that the incumbent can maintain a market share larger than 50%. Of course, in competition law there is a general verbal characterization of market dominance. For example, the European Commission defines dominance to be a position of economic strength making it possible for the dominant undertaking to behave to an appreciable extent independently of its competitors, its customers and ultimately of its consumers.

that the market discipline imposed by the entrant's uniform price is equally efficient independently of whether the incumbent operates with a uniform price or with history-based pricing. However, this does not mean that the price equilibrium would be unchanged across the two pricing systems.

Comparing (6) with (4) reveals that $p_A^d > p_A^u$, $q_A^d < p_A^u$, and $p_B^d = p_B^u$, implying that history-based price discrimination has distributional effects across different consumer segments. More precisely, consumers loyal to the incumbent are better off with uniform pricing, whereas new consumers buying from the incumbent prefer history-based price discrimination. Furthermore, consumers buying from the entrant are indifferent between uniform and history-based pricing.

When evaluating the antitrust implications of price discrimination an influential recent approach, including, for example, Innes and Sexton (1994) and Karlinger and Motta (2007), seems to persistently emphasize the following tradeoff. On the procompetitive side, for an oligopolistic industry operating within a given market structure, price discrimination intensifies competition. On the anti-competitive side, with price discrimination the dominant firm can induce exclusion more effectively by targeting competitive price offers to limited market segments, which makes it possible for the dominant firm to achieve exclusionary effects at lower costs. Our results regarding history-based price discrimination are perfectly consistent with this view as far as the procompetitive effect is concerned. However, our results do not support this view as far as the anticompetitive aspects are concerned. In this respect we find that the degree of persistence of market dominance for an incumbent facing entry is invariant across the regimes with history-based pricing and uniform pricing.

4. Welfare Comparisons

So far we have explored the effects of history-based price discrimination on market shares. We next investigate the welfare consequences of allowing an incumbent firm to exercise history-based price discrimination when facing entry of a firm producing a competing brand. Such an investigation is very important as a basis for a policy maker operating with a well-defined welfare objective to formulate a policy towards history-based price discrimination exercised by a dominant firm.

4.1 Consumer surplus

Suppose initially that the incumbent implements history-based price discrimination. In view of Figure 1, (4), and (5), aggregate consumer surplus implied by equilibrium entry is

$$\begin{aligned}
CS^d &= \theta \left\{ \int_0^{\tilde{x}^n} [\beta - q_A - \tau x] dx + \int_{\tilde{x}^n}^1 [\beta - p_B - \tau(1-x)] dx \right\} \\
&\quad + (1-\theta) \left\{ \int_0^{\tilde{x}} [\beta - p_A - \tau x] dx + \int_{\tilde{x}}^1 [\beta - p_B - \tau(1-x) - \sigma] dx \right\} \\
&= \beta + \frac{4(c_A^2 + c_B^2) - 8c_A[c_B + (1-\theta)\sigma + 9\tau] - 8c_B[9\tau - (1-\theta)\sigma]}{144\tau} \\
&\quad + \frac{\theta\sigma(\sigma + 72\tau) + 4[\sigma^2 - 18\sigma\tau - 45\tau^2] - 5\theta^2\sigma^2}{144\tau}. \quad (7)
\end{aligned}$$

We next turn to the consumer surplus with uniform pricing, where $q_A = p_A$ so that the incumbent cannot price discriminate between new and old consumers. For uniform pricing (6) implies that aggregate consumer surplus is given by

$$\begin{aligned}
CS^u &= \theta \left\{ \int_0^{\tilde{x}^n} [\beta - p_A - \tau x] dx + \int_{\tilde{x}^n}^1 [\beta - p_B - \tau(1-x)] dx \right\} \\
&\quad + (1-\theta) \left\{ \int_0^{\tilde{x}} [\beta - p_A - \tau x] dx + \int_{\tilde{x}}^1 [\beta - p_B - \tau(1-x) - \sigma] dx \right\} \\
&= \beta + \frac{c_A^2 + c_B^2 - 2c_A[c_B + (1-\theta)\sigma + 9\tau] - 2c_B[9\tau - (1-\theta)\sigma]}{36\tau} \\
&\quad + \frac{\theta\sigma(7\sigma + 18\tau) + \sigma^2 - 18\sigma\tau - 45\tau^2 - 8\theta^2\sigma^2}{36\tau}. \quad (8)
\end{aligned}$$

Subtracting (7) from (8) yields

$$CS^u - CS^d = \frac{(1-\theta)\theta\sigma^2}{16\tau} > 0. \quad (9)$$

Hence,

Result 3. *Aggregate consumer surplus is higher when an incumbent firm, exposed to competition from new entry, is unable to engage in history-based price discrimination.*

Result 3 means that consumers benefit from a policy which bans history-based price discrimination. Notice that the gain to consumers from uniform pricing increases with the switching cost parameter σ . In particular, there is no benefit from a ban on history-based price discrimination in the absence of switching costs ($\sigma = 0$). Intuitively, the switching costs determine the strategic advantage of the incumbent and by applying history-based price discrimination the incumbent can

exploit this strategic advantage. This feature is technically captured by the equilibrium prices (4). In the absence of switching costs there is no structural difference between these equilibrium prices. This implies that the incumbent firm does not profit from history-based pricing in the absence of switching costs. Also, the benefit to consumers from uniform prices is inversely related to the transportation cost parameter τ . This means that consumers gain more from uniform prices in markets characterized by more intense competition. Furthermore, (9) shows that the benefit to consumers from uniform prices is maximized when the population of old consumers is equally large as that of new consumers, i.e. when $\theta = 0.5$. Finally, from (9) we can conclude that the benefit to consumers from uniform pricing is invariant to potential efficiency differences between the firms.

4.2 Industry profit

We next explore the effects of history-based price discrimination on industry profits. We first consider the entrant. From (4), (5), and (6) we find that the entrant's profit is invariant to whether the incumbent firm exercises history-based price discrimination or uniform prices. Formally, the entrant's profit is given by

$$\pi_B^d = (1 - m_A^d)(p_B^d - c_B) = \frac{[\Delta c - (1 - \theta)\sigma + 3\tau]^2}{18\tau} = (1 - m_A^u)(p_B^u - c_B) = \pi_B^u \quad (10)$$

under history-based discrimination and uniform pricing, respectively. In line with intuition, the entrant's profit decreases with the switching costs facing old consumers σ and increases with the fraction of new consumers θ . Clearly, the entrant's profit also increases with its cost advantage Δc . Therefore, we can formulate the following conclusion:

Result 4. *The entry decision of a firm introducing a competing brand is invariant to whether the incumbent firm implements history-based pricing or uniform pricing.*

Result 4 means that imposing a ban on history-based price discrimination does neither encourage nor discourage entry compared with uniform pricing. This result has strong implications for the nature of how history-based price discrimination might hurt consumers. It implies that the potential abuse of consumers imposed by history-based price discrimination is exploitation, not exclusion. Of course, this conclusion does not mean that price discrimination does never introduce the threat of exclusionary abuse. In fact, as our literature survey in the introduction emphasizes, price discrimination across separated markets may, depending on the price elasticity of the captive market compared with that of the competitive market, very well promote the possibilities of a dominant firm

to conduct exclusionary abuse. Our conclusion is reached within the framework of a model focusing exclusively on history-based price discrimination within one market, but we have not analyzed the effects of price discrimination across separated markets.

Our analysis is formally conducted in the absence of sunk and fixed costs of entry. Result 4 implies that the entry costs required for entry deterrence are independent of whether the incumbent adopts history-based or uniform pricing.

We next shift to the effects of price discrimination on the incumbent's profits. Inspecting (4) reveals that in equilibrium the incumbent offers a price discount to new consumers ($p_A^d > q_A^d$) if history-based discrimination is allowed. Because the incumbent also has the option of setting a uniform price ($p_A^d = q_A^d$), a "revealed preference" argument implies that history-based discrimination must promote the incumbent's profits. In order to evaluate total welfare, we must nevertheless compute the equilibrium profits under the two pricing regimes. Using (4) and (5), the incumbent's profit with history-based pricing is

$$\begin{aligned}\pi_A^d &= \theta \tilde{x}^n (q_A^d - c_A) + (1 - \theta) \tilde{x} (p_A^d - c_A) \\ &= \frac{4(c_A^2 + c_B^2) - 8c_A[c_B + (1 - \theta)\sigma + 3\tau] + 8c_B[(1 - \theta)\sigma + 3\tau]}{72\tau} \\ &\quad + \frac{\theta\sigma(\sigma - 24\tau) + 4(\sigma^2 + 6\sigma\tau + 9\tau^2) - 5\theta^2\sigma^2}{72\tau}.\end{aligned}\quad (11)$$

From (6), the incumbent's profit under uniform pricing is

$$\pi_A^u = m_A^u (p_A^u - c_A) = \frac{[\Delta c - (1 - \theta)\sigma - 3\tau]^2}{18\tau}.\quad (12)$$

Subtracting (12) from (11) yields

$$\pi_A^d - \pi_A^u = \frac{(1 - \theta)\theta\sigma^2}{8\tau} > 0,\quad (13)$$

which characterizes exactly the profit gain to the incumbent from implementing history-based price discrimination.

4.3 Social welfare

So far we have shown that (a) consumers are worse off when the incumbent firm implements history-based pricing, (b) the entrant earns the same profit under the two pricing regimes, and (c) the incumbent earns a higher profit under history-based pricing. To determine the net effect of history-based price discrimination on social welfare (defined as the sum of aggregate consumer

surplus and total industry profits) we only need to compare the differences computed in (9) with (13). This calculation shows that

$$\Delta W = W^d - W^u = \frac{(1-\theta)\theta\sigma^2}{8\tau} - \frac{(1-\theta)\theta\sigma^2}{16\tau} = \frac{(1-\theta)\theta\sigma^2}{16\tau} > 0. \quad (14)$$

Therefore,

Result 5. *History-based pricing exercised by an incumbent firm promotes social welfare.*

History-based pricing introduces a distributional conflict between the incumbent and consumers. Result 5 means that the profit gain from history-based pricing to the incumbent exceeds the associated loss to consumers. Moreover, the welfare differential is small when θ is low and markets are rather stationary or when θ is high and markets are very dynamic. The welfare differential grows proportionally with the square of switching costs and is inversely related to the measure of market differentiation τ . Interestingly, the welfare comparison matters most in highly competitive markets as measured by a low τ . Finally, the welfare differential is not affected by differences in marginal costs.

In order to understand the sources behind the total welfare gains associated with history-based pricing, captured by (14), it is valuable to highlight the effects of history-based pricing on market shares among “old” consumers. By comparing (5) and (6) we can conclude that $0.5 < \tilde{x} < \tilde{x}^u$. This means that more “old” consumers switch to the entrant with history-based pricing than with uniform pricing. The associated increase in aggregate switching costs under history-based price discrimination implies a welfare loss. At the same time, $0.5 < \tilde{x} < \tilde{x}^u$ also implies that the market outcome under history-based pricing economizes on transportation costs compared with uniform pricing. In other words, uniform pricing causes a higher degree of preference mismatch for the old consumers, meaning that they have to bear higher aggregate transportation costs. Since our analysis focuses on Hotelling competition, price effects represent a redistribution of surplus between consumers and producers, whereas aggregate transportation costs as well as switching costs are deadweight losses to the economy. Our total welfare comparison essentially shows that the transportation cost effect dominates, and for that reason history-based price discrimination promotes total welfare.

5. Conclusion

In this study we analyzed the effects of history-based price discrimination on entry and welfare in a model where an incumbent, protected by switching costs, faces an entrant who does not have access

to information about consumers' purchase histories. We initially explored the effects of history-based pricing on market shares and found the persistence of market dominance for the incumbent to be invariant across the regimes with history-based pricing and uniform pricing. Nevertheless, a detailed welfare analysis revealed that consumers would benefit from a policy which bans history-based price discrimination insofar as consumer surplus is higher with uniform pricing than with history-based pricing. According to our analysis, history-based price discrimination was found to neither discourage nor encourage entry. This implies that the potential abuse of market dominance imposed by history-based price discrimination is exploitation, not exclusion. This is remarkable because the standard attempts to ban price discrimination typically focus on exclusion as a manifestation of abuse of market dominance. For example, the European Commission "has issued on 3 December 2008 Guidance on its enforcement priorities in applying Article 82 to abusive exclusionary conduct by dominant undertakings."⁷ Our results imply that the potential abuse associated with history-based pricing by a dominant firm is exploitation without exclusion. Finally, we established that the profit gain from history-based pricing to the incumbent exceeds the associated loss to consumers.

Of course, we are by no means saying that exclusionary concerns are not important when analyzing the antitrust effects of history-based price discrimination. In this respect we are not implying that enforcement policies of the European Commission are necessarily wrong, but we add an important concern largely overlooked in the current debate. We argue that under simple and theoretically appealing configurations it is well possible that the antitrust concern is exploitation, not exclusion. It should also be emphasized that there are important theoretical studies in support of the Commission's enforcement priorities. For example, Chen (2008) focuses on an asymmetric duopoly, where history-based pricing by a dominant firm poses an anticompetitive threat precisely when it facilitates predation based on the exit of the small rival. Theoretically Chen (2008) analyzes the effects of history-based pricing in an environment which is very different from ours. We focus on a standard Hotelling model, whereas Chen offers an analysis with an arbitrarily long time horizon and with a segmented market where the firms do not compete head-to-head when they apply uniform pricing.

Our study has the policy implication that the potential abuse of market dominance imposed by history-based pricing is exploitation, not exclusion. This is highlighted, since in our example the entrant's profit is invariant across the pricing regimes with discriminatory history-based prices and uniform prices. Of course, our example draws heavily on the linear structure of the standard Hotelling framework. That framework has the implication that the optimal pricing scheme of the

⁷See <http://ec.europa.eu/competition/antitrust/art82/index.html>.

incumbent with one or two price instruments will always generate the same incumbent market share for any feasible price quote of the entrant. In more general frameworks the invariance results will not generally prevail. In those cases some element of exclusionary concern will be added to the exploitative issue that we focus on. In any case, policy recommendations will depend on the relative strengths of these concerns in the relevant markets.

Throughout this study we have analyzed the effects of history-based pricing on entry and welfare within the framework of a very limited horizon. If entry takes place, the strategic interaction between the incumbent and the entrant could continue for many periods. After entry both competitors could then apply history-based pricing. Within such a framework one could investigate the dynamics of dominance and, in particular, characterize the market shares towards which the process would converge and also explore the associated welfare consequences.⁸ In ongoing work we analyze the welfare effects of history-based price discrimination within the context of an asymmetric duopoly model, where one firm has inherited a dominant market position, but where both firms can apply history-based pricing.⁹ It remains an interesting challenge for future research to incorporate such an analysis into an entry model with a longer horizon. How will the ability of firms to exploit historical information about their customers for a longer horizon affect pricing and market shares? Would this process converge to perfect price discrimination in the limit, and what would be the consequences of a ban on using such information and other privacy restrictions?

Entry barriers can be introduced in several ways. Following the large literature in industrial economics, the traditional approach to entry barriers is to view them as stemming from having sunk and fixed costs of entry. This literature has analyzed in great detail strategic entry deterrence. In Karlinger and Motta (2007) the presence of network externalities generates an entry barrier, and within the context of such a model they demonstrate that price discrimination may induce exclusion which is not the case in the present analysis. In the present analysis, the switching costs constitute the entry barrier. This could be particularly relevant in, for example, service industries such as online shopping, the airlines industry, and banking, where the informational advantages created through an established customer relationship might represent a significant entry barrier.

⁸With respect to the dynamics of price equilibria and market shares, Chen (2008) and Beggs and Klemperer (1992) have made valuable contributions. They have not, however, explored the antitrust implications and, in particular, they have not explored the consequences for persistence of dominance.

⁹Chen (1997) developed the first formal model of behavior-based pricing based on consumer purchase histories in the presence of switching costs. Taylor (2003) and Gehrig and Stenbacka (2004, 2007) presented further developments and applications of symmetric oligopoly models of this type. Fudenberg and Tirole (2000) studied the same type of pricing strategies in an alternative general model with ex ante product differentiation, but without switching costs.

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