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Consumer poaching, brand switching, and price transparency

Christian Schultz

Department of Economics, University of Copenhagen, Denmark

HIGHLIGHTS

- I model price transparency in markets with behavioral price discrimination.
- I examine effects of changes in price transparency.
- Increasing transparency reduces price discrimination and benefits consumers.
- Increasing transparency increases competition, lowers prices and profits.
- Brand switching and welfare effects depend on availability of long-term contracts.

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ABSTRACT

This paper addresses price transparency on the consumer side in markets with behavioral price discrimination which feature welfare reducing brand switching. When long-term contracts are not available, an increase in transparency intensifies competition, lowers prices and profits, reduces brand switching and benefits consumers and welfare. With long-term contracts, an increase in transparency reduces the use of long-term contracts, leading to more brand switching and a welfare loss. Otherwise, the results are the same as without long-term contracts.

1. Introduction

In many markets firms know their customers' identity. This enables them to poach potential new customers with an introductory discount. Such behavioral price discrimination is observed e.g., in mobile phone markets, insurance markets, and in newspaper subscriptions. In these markets it is not always easy to compare prices. This begs the question: what is the effect of behavioral price discrimination when some consumers are not well-informed about prices, i.e., where transparency on the consumer side is not perfect? Is an increase in transparency pro-competitive, as it usually is in markets without behavioral price discrimination? Many countries prohibit long-term contracts. In Denmark, for instance, it is illegal to tie consumers for more than half a year in mobile telephony market. Is that wise?

This paper addresses these questions. Building on Fudenberg and Tirole (2000) it introduces market transparency through a fraction of consumers who do not observe prices but have price expectations. I first consider the case where firms cannot offer long-term contracts. Forward-looking consumers realize that buying from a firm in the first period implies that it will not poach them with a low price in the second period. This lowers the elasticity of demand in the first period and lead to higher first period prices and less brand switching and lower prices in the second period as shown by Fudenberg and Tirole. I show that this effect is intensified when the transparency of the market is low since it makes the first period elasticity of demand even lower. In the second period more switching to a less preferred brand induces a further welfare loss. Hence, prices, price discrimination and brand switching are reduced and welfare improved if the market becomes more transparent.

Long-term contracts make the firms compete over the larger long-term market; this intensifies competition, and thus the contracts are bad for firms as shown by Fudenberg and Tirole. Long-term contracts improve welfare, fewer consumers switch brand

E-mail address: cs@econ.ku.dk.
URL: http://www.econ.ku.dk/Cschultz.

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and prices in both periods fall. I show that the use of long-term contracts is larger when transparency is low, since the market then is even more profitable. Hence, when transparency increases, profitability decreases and firms offer fewer long-term contracts. This increases the contestable share of the market in the second period and induces more brand switching and a welfare *loss*. It hurts firms and benefits consumers: first period prices and second period poaching prices fall, while second period prices to old customers are not affected. The long-term contract price falls.

Behavioral price discrimination has been studied extensively, see the surveys by Armstrong (2006) and Fudenberg and Villas-Boas (2007). Market transparency has been analyzed for instance in Varian (1980), Stahl (1989), Schultz (2004, 2009), Sinitsyn (2009) and Gu and Wenzel (2011). To my knowledge, no papers consider the effect of market transparency under behavioral price discrimination.

2. Basics

Consider a differentiated Hotelling market over two periods. Consumer x is located in $x \in [0, 1]$, firm A in 0 and firm B in 1. Consumers know firms' locations. Marginal costs are constant, normalized to zero. In each period, a consumer buys at most one unit. If she buys at price p from a firm located d away, her utility is

$$V = u - p - td,$$

where $u > 0$ and $t > 0$. Firms and consumers both have the discount factor $\delta \in]0, 1]$. A consumer can only visit one firm per period and only a fraction, ϕ, of consumers is informed about prices before deciding which firm to visit as in Varian (1980); ϕ is our measure of transparency. The uninformed consumers have rationally expected prices equal to the actual prices in equilibrium. Both information types are uniformly distributed on [0, 1]. We assume that

$$\frac{1}{3}\left(\frac{4}{\phi} - \frac{1-\phi}{(\phi+2)^2}\right) + \frac{1}{2} < \frac{u}{t} < \frac{2+\phi\left(3-2\phi-\phi^2\right)}{2\phi\left(2-\phi-\phi^2\right)}. \tag{1}$$

The first inequality ensures that the market is covered in equilibrium and the second a firm will not deviate to a high price and only serve the uninformed consumers. This ensures that a pure strategy equilibrium exists.[1] Fulfilling both restrictions requires $\phi > \underline{\phi} \approx 0.69$.

The firms know that a fraction ϕ of consumers are uninformed but not who they are. Firms do not know the consumers' locations but in the second period they recall who were old customers so they can price discriminate: firm A offers $\hat{p}_A$ to repeat customers and p_A to newcomers.

We focus on a symmetric equilibrium, the uninformed consumers expect symmetric prices and those with $x \leq 1/2$ buy from firm A and the rest from B. We solve the model backward (for a perfect Bayesian equilibrium).

3. Behavioral price discrimination

In the second period, the timeline is: firms set prices, which are observed by the informed consumers only. Uninformed consumers form expectations depending on their observations in the previous period. Then consumers decide on purchases.

First, consider firm A's turf, its old customers: informed consumers with $x \leq \frac{1}{2} + \gamma$, where $\gamma \gtrless 0$, and uninformed consumers with $x \leq 1/2$. Here firm A offers $\hat{p}_A$ while firm B offers p_B. As usual, we need to solve second period subgames on and off the equilibrium path. We therefore consider subgames in period two, where one firm, B, has set the equilibrium price in the first period and the other firm, A, has possibly deviated so the first period market shares may be non-symmetric. Since the firms are initially in a symmetric situation, this suffices for our purposes. The indifferent, informed consumer is located at

$$x\left(\hat{p}_A, p_B\right) = \frac{1}{2} + \frac{p_B - \hat{p}_A}{2t},$$

while the indifferent, uninformed consumer is at $x = \alpha$. Firm A's demand from its home turf is

$$D_{AA} = \phi x\left(\hat{p}_A, p_B\right) + (1-\phi)\,\alpha.$$

The uniformed consumers on A's turf have observed A's period one price. If A did not deviate in period one, $\gamma = 0$, and rational price expectations entail that $\hat{p}_A^e = \hat{p}_A(0)$ and $p_B^e = p_B(0)$, where $\hat{p}_A(\gamma)$ and $p_B(\gamma)$ are second period equilibrium prices given γ. A deviation by firm A in period one is an out-of-equilibrium event and accordingly Bayes' rule does not determine expectations. I assume that consumers understand that the non-symmetric market shares in period one, $\gamma \neq 0$, imply, $\hat{p}_A^e = \hat{p}_A(\gamma)$ and $p_B^e = p_B(\gamma)$, so $\alpha = x\left(\hat{p}_A(\gamma), p_B(\gamma)\right)$. One may alternatively assume that consumers have passive beliefs, which do not change after an out-of-equilibrium price has been observed in period 1. As it turns out the qualitative results reported here do not change.[2]

Firm A maximizes profit $\hat{p}_A D_{AA}$ taking as given α. Taking the first-order condition and then inserting for α gives A's best reply

$$\hat{p}_A = \frac{1}{1+\phi}\left(t + p_B\right).$$

Firm B's demand on A's turf is

$$D_{BA} = \phi\left(\frac{1}{2} + \gamma - x\left(\hat{p}_A, p_B\right)\right) + (1-\phi)\left(\frac{1}{2} - \alpha\right). \tag{2}$$

Maximizing profit, $p_B D_{BA}$, and then inserting for α gives B's best reply

$$p_B = \frac{\hat{p}_A + 2t\gamma\phi}{1+\phi}. \tag{3}$$

Solving for the equilibrium prices

$$\begin{aligned} \hat{p}_A(\gamma) &= \left(\frac{1+\phi}{\phi\,(2+\phi)} + \frac{2\gamma}{2+\phi}\right)t \quad \text{and} \\ p_B(\gamma) &= \left(\frac{1}{\phi\,(2+\phi)} + \frac{2\gamma\,(1+\phi)}{2+\phi}\right)t. \end{aligned} \tag{4}$$

Therefore

$$\alpha = \alpha(\gamma) = \frac{1+\phi}{2\,(2+\phi)} + \frac{\gamma\phi}{2+\phi}.$$

In the first period informed consumers $x \geq 1/2 + \gamma$ and uninformed consumers $x \geq 1/2$ bought from B. The latter did not see A's first period price p_{A1}. In a symmetric equilibrium, they

[1] The analysis of mixed strategies is bound to be very complicated. See Sinitsyn (2009) for an analysis in a differentiated Hotelling market with no behavioral price discrimination.

[2] Due to the space constraint these results are not reported here but are available on request. I am grateful to a referee for pointing out that passive beliefs may be a realistic alternative to the belief formation assumed in the main text.