

Experimental Evidence of Behavior Based Pricing¹

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Sellers have long engaged in various forms of price discrimination (see Varian 1989; Stole 2007). However, recent technological advances have given sellers even more information about their customers including the ability to track people across shopping episodes. With such information sellers can either attempt to reward loyalty or poach from rivals. Indeed, both practices are now commonly observed. Many airlines and retailers offer perks to loyal customers, while credit cards and insurance companies commonly advertise low introductory rates to new customers. In each of these cases sellers are basing prices on the shopper's previous behavior.

In a recent paper, Chen and Pearcy (2010) develop a model that captures several key pieces of the behavior based pricing problem. They also consider a basic two period duopoly Hotelling model and show that the optimality of rewarding loyalty versus poaching depends on 1) the ability to pre-commit to future prices for repeat customers and 2) the degree to which buyer preferences vary between periods. In particular, Chen and Pearcy (2010) show that regardless of the ability to pre-commit to future prices, a lack of heterogeneity across time should lead to poaching. However, when there is heterogeneity in preferences over time and sellers can

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guarantee a future price to repeat buyers then loyalty is rewarded. The logic is that the low future price induces people to visit the seller initially and attract back those who may ultimately find themselves preferring the competitor in the future without having to offer low prices to those who do not visit initially but change to preferring that seller in the future. If there is sufficient heterogeneity and an inability to commit to future prices then the market essentially becomes a repeated single period Hotelling game as in Fudenberg and Tirole (2000).

While sellers routinely have to make the decision to poach or offer loyalty discounts, it can be difficult to study such markets empirically, because customer preferences and “distance costs” are inherently unobservable. Therefore, we turn to controlled laboratory experiments to empirically explore how the factors identified by Chen and Pearcy (2010) impact behavior based pricing.

We conducted a series of controlled laboratory experiments using a 2×2 design. Corresponding to the four cases based on the combination of two dimensions. The first dimension was the relationship of values between periods (fixed or independent) and the second dimension was the ability to pre-commit to the price charged to repeat customers (not possible or possible).

In order to aide subject comprehension, the task was presented to subjects as a problem faced by a pair of ice cream vendors located at opposite end of a beach on a crowded day. Each “day” in the experiment a subject could set a morning price for everyone and separate afternoon prices for repeat and new customers. As explained to the subjects, all of the buyers in the market were computerized robots who determined their decisions based only on price and travel distance and behaved optimally given the observed prices. For simplicity, each subject was presented the task as though she was firm A located at 0 and their rival was firm B located at $\bar{\theta} = 120$.

A session consisted of four subjects. To eliminate repeated play incentives, each “day” subjects were randomly and anonymously rematched with someone else in their session. Treatment effects are evaluated between subjects as each session involved only a single treatment case. After entering the lab, subjects read printed instructions and completed a comprehension handout. Once everyone had completed the handout the experiment began. The experiment

lasted 20 “days” and the subjects were paid their cumulative earnings, which were converted from the lab dollars used in the experiment to cash at the rate of 2500 Lab Dollars = US\$0.10. Subjects did not know in advance how many “days” the experiment would last, but did know the exchange rate. The experiments were conducted in The Behavioral Business Research Laboratory at the University of Arkansas.

The results of our experimental study generally support the comparative static results of the theoretical model, although the point predictions typically do not. In general, there is less deference between prices in different treatments than predicted. Morning prices are higher than afternoon prices as predicted in most cases, although morning prices are also higher in the baseline where this change is not predicted. When buyer preferences are not stable over time and sellers cannot make price pre-commitments, sellers should not differentiate between new and repeat customers and on average they do not. Fixing customer preferences over time should lead to seller’s exploiting repeat customers and poaching new customers from rivals and this is what we observe. Allowing price pre-commitment for repeat shoppers when buyer values are independent over time should lead to loyalty discounts being offered. Loyalty discounts are more likely to be observed in this case, but the size of the discounts does not match the theoretical prediction. This appears to be due in part to the fact that the predicted loyalty discounts actually involve pricing below cost, something the subject sellers were reluctant to do although it is far more common in this case than in any of the others. The results also indicate that subject sellers are basing their prices on information that is not relevant in equilibrium. However, if out of equilibrium behavior is taken as a signal of future pricing then this response could be optimal. For example, if one believes that a seller who sets a relatively high price in the morning will also overprice later in the day, then increasing one’s own afternoon prices could be reasonable. Another interesting finding is that the ability to pre-commit to prices has a greater impact on price levels than the intertemporal relationship among buyer values. In particular, the use of price pre-commitments lead to lower prices and thus lower profits for seller indicating that the practice may be something seller want to avoid.

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