14 Competitive targeted pricing: perspectives from theoretical research*

Z. John Zhang

Abstract

With an unprecedented capability to store and process consumer information, firms today can tailor their pricing to individual consumers based on consumer preferences and past buying behaviors. In this chapter, we discuss this nascent practice of targeted pricing from a theoretical perspective. We focus on three main questions that are relevant to assessing the future of this practice. First, is targeted pricing beneficial to practicing firms? Second, if a firm decides to embrace targeted pricing, what should be its targeting strategy in terms of whom to target and with what incentives? Third, is targeted pricing beneficial to the society as a whole? We draw on the existing literature on targeted pricing to offer some preliminary answers to these questions.

1. Introduction

Targeted pricing, as the term is commonly used by practitioners, refers to the practice where a firm tailors its prices of a product to individual customers based on some discernible differences in their preferences, willingness to pay, buying behaviors, etc. For instance, when selling magazines, a publisher may decide to offer a discount to a new subscriber, but withhold the same discount from someone who has been a loyal subscriber for years. In the famous battle for market share between AT&T and MCI in the early 1990s, AT&T successfully persuaded many MCI customers to switch carriers by offering them personalized checks in the amounts of $25 to $100 depending on each consumer's long-distance calling history and experience with AT&T (Turco, 1993). Today, many industries adopt some form of targeted pricing when they have actionable customer information, and such practices are also variably called 'one-to-one pricing', 'personalized pricing', 'tailored pricing', and sometimes 'dynamic pricing'.

On the surface, targeted pricing is nothing new and merely a form of price discrimination. The textbook definitions for different forms of price discrimination we use today came from the English economist Arthur C. Pigou (1877–1959). In his book *Economics of Welfare*, originally published in 1920, Pigou articulated three forms of price discrimination that a monopolist could implement. To use Pigou's words,

> A first degree would involve the charge of a different price against all the different units of commodity, in such wise that the price exacted for each was equal to the demand price for it, and no consumers' surplus was left to the buyers. A second degree would obtain if a monopolist were able to make n separate prices, in such wise that all units with a demand price greater than x were sold at a price x, all with a demand price less than x and greater than y at a price y, and so on. A third degree would obtain if the monopolist were able to distinguish among his customers n different groups, separated from one another more or less by some practicable mark, and could charge a separate monopoly price to the members of each group. (Pigou, 1929, p. 278)

However, targeted pricing as practiced in industries today frequently does not fit any of these different forms of price discrimination. For instance, when amazon.com targets its loyal customers with a high price for a book, while charging a new, occasional purchaser a low price for the same, it implements a pricing scheme that cuts across all three forms of price discrimination and, arguably, goes beyond what has been understood to be the standard practices of price discrimination. First, amazon.com's pricing scheme is based primarily on past buying behaviors, rather than on any invariable 'practicable mark' such as gender, age and other demographics. Therefore this practice of targeted pricing is not exactly the third degree of price discrimination where customers with the same characteristics, say being students or senior citizens, are charged the same price. Second, it is not exactly the second degree of price discrimination, either, as both loyal and occasional purchasers are buying the same amount. In addition, it is amazon.com that is assigning a price to individual customers, and customers do not have a chance to self-select in terms of what they end up paying. Finally, this pricing practice is almost certainly not first-degree price discrimination, as the pricing scheme does not tap into variations in willingness to pay that must exist among loyal as well as among occasional customers.

It is perhaps not surprising that a classification scheme developed nearly a century ago can no longer encompass an ever-increasing number of different schemes of price discrimination concocted today by increasingly sophisticated practitioners. In the area of price discrimination, two market forces drive today's practitioners to become ever more inventive. First, the availability of new information technologies and sophisticated database analytics, and the widespread use of Internet transactions allow firms to gather and process detailed customer information on a large scale and in a timely and cost-effective manner. Consequently, firms are having ever-sharper pictures of individual customers so that they can move away from a labor-intensive targeting approach (Desai and Purohit, 2004) and go beyond static, obvious variables such as demographics and purchasing quantities in designing their price discrimination schemes. They can look into consumer preferences, loyalties and other psychographics, as well as geographic and other discernible and quantifiable differences among customers. Second, as the marketplace is becoming increasingly competitive, firms need to tune their pricing schemes constantly to stay ahead of competition when searching and capturing the last pockets of profitability in the marketplace.[1]

The proliferation of targeted pricing practices challenges not only the standard taxonomy of price discrimination, but also much of the conventional wisdom about price discrimination. One such piece of conventional wisdom is that price discrimination should always benefit the practicing firm whether it implements first-, second- or third-degree price discrimination. After all, a firm, by being a monopoly, has the choice not to implement any price discrimination. However, in today's market environment, this logic is no longer valid, and certainly not in the industries where we frequently observe targeted pricing. For example, in the case of AT&T mentioned above, competition is a driving force behind its practice of targeted pricing. Indeed, AT&T's primary targets for its switching checks were MCI's customers. Armed with customer usage information in

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[1] Of course, even with conventional price discrimination schemes, competition intensity in a market plays an important role, as shown in Desai (2001).

addition to customer addresses and demographics, AT&T could identify the switchable customers who were served by MCI and gauge the strength of their preferences for MCI to determine the right incentives required to induce them to switch. In this case, price discrimination was implemented based on consumer relative preferences. In addition, targeted pricing did not and could not take place in an insulated market where AT&T could ignore any competitive reactions. As a matter of fact, MCI implemented its own targeted pricing campaign to switch AT&T's customers, too. As a result of competitive targeted pricing, millions of customers switched (perhaps multiple times) between the two firms as they cashed the switching checks received from both firms.

In this new reality of price discrimination, three fundamental questions arise that are of interest to practitioners and marketing scholars alike. First, can firms benefit from targeted pricing in oligopolistic markets? Many practitioners and experts may be tempted to offer a quick 'yes'. However, the answer is not that obvious, considering the complexity involved in implementing targeted pricing in terms of costs, competitive reactions and consumer responses. Yet the answer to this question gives us a perspective to guide the practice of targeted pricing and to assess its future. For instance, if firms become worse off because of targeted pricing, they may not have much incentive to invest in their targeting capability or they may want to seek ways to restrain targeted pricing in their industry. The answer to this question also offers some strategic prescriptions as to whether a firm should adopt targeted pricing and how it should prepare itself for such a future.

Second, if a firm decides to implement targeted pricing, what should be its targeting strategy? In other words, if a firm can identify consumers and charge different prices to different consumers, how should it deploy its capabilities? More concretely, should the firm target its competitor's customers with a discount, its own customers, or both? Our answer to this question can help us to understand the current practice of targeted pricing and offer some strategic guidance to practitioners.

Third, does targeted pricing improve social welfare? Marketers need to pay attention to this question because welfare implications do have regulatory implications, and our answer to this question may affect the legal environment in which targeted pricing is conducted.

In this chapter, we take a brief tour of the recent literature on targeted pricing to see how it answers those three questions. Before we start on that tour, three points are worth noting. First, targeted pricing is a nascent practice. Few data are available that can help us to address those three questions. For that reason, empirical research on targeted pricing mostly focuses on how a firm can or should implement targeted pricing given that it has a certain kind of customer information (Rossi and Allenby, 1993; Rossi et al., 1996; Dong et al., 2006; and Zhang and Wedel, 2007). Theoretical research, in contrast, is uniquely suited for addressing all three questions in a competitive context. Therefore, in this chapter, we focus exclusively on the theoretical literature on targeted pricing.

Second, targeted pricing is an evolving practice, and new ways to implement targeted pricing emerge all the time. Therefore it is infeasible and perhaps even unwise to try to catalog all of the existent practices. The theoretical literature on targeted pricing so far mostly focuses on preference-based and behavior-based targeted pricing and we shall do the same in this chapter. Third, most of the theoretical studies on targeted pricing are fairly complex technically. Such technical complexity has sometimes rendered the literature inaccessible to a broad audience. Therefore, in our opinion it is desirable to discuss the messages of the literature without being unduly encumbered by technicalities.

Towards that objective, we shall use simplified models instead of the original models, whenever possible, to illustrate the basic economics behind the main conclusions of this literature. In what follows, we take up each of the three questions in turn.

2. Would firms benefit from targeted pricing?

The simple answer to this question is 'it depends'! That is, of course, the easy part of the answer. The difficult part is to figure out what it depends on. Many researchers, such as Thisse and Vives (1988), Shaffer and Zhang (1995), Bester and Petrakis (1996), Chen (1997), Fudenberg and Tirole (2000), and Taylor (2003), have investigated this question with different models. We can use a simple model to capture the gist of their arguments.

In any market where targeted pricing is implemented, consumers must be heterogeneous in their preferences and firms must be selling a differentiated product. We can use the standard Hotelling (1929) model to capture both market conditions. Concretely, consider two firms located respectively at 0 and 1 of a unit Hotelling line and set their prices independently. For simplicity, we assume away all production costs. Consumers in the market are uniformly distributed along the unit line and we normalize the number of consumers to one, so we do not need to carry a constant around in our computations. To follow convention, we further assume that each consumer in the market makes at most only a single unit purchase if such a purchase generates positive surplus.

Before a consumer makes a purchase, she will compare the surplus she would get from Firm 1 with that from Firm 2, and choose the firm that provides the most surplus. To make the choice decision more concrete, let V stand for the reservation price that consumers are willing to pay for their 'ideal' product and let t denote the unit transportation cost that a consumer must incur to purchase a non-ideal product. Then, for a consumer located at x $\in$ [0, 1], if she purchases from Firm 1 at the price p_1, the surplus she obtains is $V - p_1 - tx$. If she purchases from Firm 2 at the price p_2, her surplus is $V - p_2 - t(1 - x)$. Thus, depending on the location x, even if both firms charge the same price to a consumer, the consumer will have a definite preference in terms of where she prefers to make the purchase – she will purchase the product that is closer to her ideal product. This preference heterogeneity gives rise to the possibility of using targeted pricing to compete for customers.

To isolate the effect of targeted pricing, let us first establish the benchmark of uniform pricing where each firm can only charge one price to all consumers. In this case, we can easily identify the location of marginal consumers $\tilde{x}$ such that to the left of $\tilde{x}$, all consumers purchase from Firm 1 and, to the right, all consumers purchase from Firm 2. From $V - p_1 - t\tilde{x} = V - p_2 - t(1 - \tilde{x})$, we have

$$\tilde{x} = \frac{p_2 - p_1 + t}{2t} \tag{14.1}$$

Then it is easy to write down each firm's payoff function and they are, respectively, $\pi_1 = p_1 \tilde{x}$ and $\pi_2 = p_2(1 - \tilde{x})$. As each firm sets its price to maximize its payoffs, we can derive the equilibrium prices and profits from the first-order conditions and they are, respectively, $p_1 = p_2 = t$ and $\pi_1 = \pi_2 = t/2$. The equilibrium is illustrated in Figure 14.1.

In this equilibrium of uniform pricing, the two competing firms share the market equally, i.e. $\tilde{x} = \frac{1}{2}$. A firm has no incentive to price more aggressively to gain a larger market share in this case because by cutting its price to lure marginal consumers away from the competition, the firm also cuts its price to all consumers who would have purchased from the

(a) Unilateral targeting by Firm 1   (b) Competitive targeted pricing
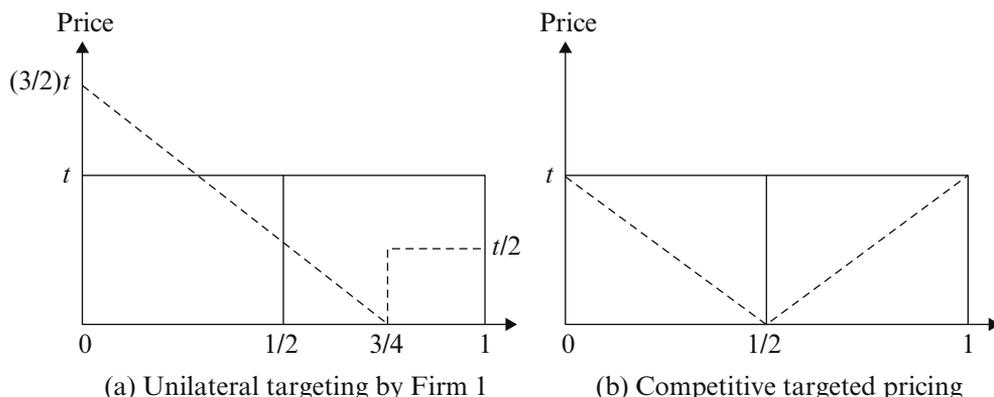
Note: The benchmark case of uniform pricing is illustrated with solid lines in both cases.

Figure 14.1 *Equilibrium prices and market share*

firm without the price cut. In other words, without the flexibility of charging different customers at different locations a different price, a firm must leave more money on the table for those non-marginal customers in order to generate more incremental sales. However, targeted pricing gets a firm out of that bind and gives it the needed flexibility.

To see this, suppose that Firm 1 suddenly gains the capability of implementing targeted pricing in the sense that it can set location-specific prices $p_1(x)$ for all $x \in [0, 1]$, but Firm 2 cannot. In this case, in any equilibrium, there still exists an $\tilde{x}$ such that all consumers located to the right of $\tilde{x}$ will purchase from Firm 2 and to the left from Firm 1. Then, at $\tilde{x}$, given that Firm 1 can charge a location-specific price $p_1(\tilde{x})$, it must be the case that Firm 1 sets $p_1(\tilde{x}) = 0$, which is Firm 1's marginal cost. Otherwise, Firm 1 can always lower its $p_1(\tilde{x})$ slightly to secure the patronage of the consumers located at $\tilde{x}$ and increase its profit. This means that for any given p_2, we can obtain the location of the marginal consumers for this case of unilateral targeting by replacing p_1 in equation (14.1) with 0, i.e. $\tilde{x} = (p_2 + t)/2t$.

To determine Firm 1's prices for consumers located at $x < \tilde{x}$, we note that Firm 1 has no incentives to offer to anyone a price that is lower than what is needed to make a consumer indifferent between buying from Firm 1 and from Firm 2. In other words, the equilibrium $p_1(x)$ is determined by setting $V - p_1(x) - tx = V - p_2 - t(1 - x)$ for $x < \tilde{x}$. Therefore, we should have in equilibrium

$$p_1(x) = \begin{cases} p_2 + t(1 - 2x) & \text{if } x \leq \tilde{x}, \\ 0 & \text{if otherwise} \end{cases} \quad (14.2)$$

Firm 1's payoff is then given by $\pi_1 = \int_0^{\tilde{x}} p_1(x)\,dx$ and Firm 2's payoff by $\pi_2 = p_2(1 - \tilde{x})$. By taking the first-order condition with respect to Firm 2's payoff,[2] we can easily

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[2] Here, we follow the example in Thisse and Vives (1988) to treat Firm 1 as a price follower when it implements targeted pricing because of its pricing flexibility.

determine the optimal price for Firm 2 and hence the optimal pricing schedule for Firm 1. We illustrate this equilibrium of unilateral targeting in Figure 14.1(a).

In this equilibrium of unilateral targeted pricing, Firm 1 is better off, with its profit increasing from $t/2$ in the case of uniform pricing to $\frac{9}{16}t$. From Figure 14.1(a), we can see that Firm 1 is better off for two reasons. First, Firm 1 can tailor its prices to customers based on their strength of preference, offering varying discounts to those who have progressively stronger preferences for Firm 2. This flexibility in pricing helps Firm 1 to increase its market share from $\frac{1}{2}$ to $\frac{3}{4}$ (see Figure 14.1a). This is 'the market share effect'. Second, Firm 1 can also charge progressively higher prices to those who have progressively stronger preferences for its own product. This is 'the price discrimination effect'. Because of these two effects, most practitioners and experts have intuitively come to the conclusion that targeted pricing will always benefit the practicing firm.

However, this need not be the case. In Figure 14.1(a), we get a hint as to why a practicing firm may not benefit in a competitive context. When both firms adopts uniform pricing, they each set their price at t. However, when Firm 1 has the capability of deploying targeted pricing, Firm 2 responds by lowering its price from t to $t/2$ in an effort to counter the threat of targeted pricing from Firm 1. In other words, targeted pricing can potentially trigger more intense price competition. We can see this 'price competition effect' more clearly if we also allow Firm 2 to implement targeted pricing so that we have competitive targeted pricing in the market.

When both firms can set a location-specific pricing schedule, respectively $p_1(x)$ and $p_2(x)$, we can follow the similar steps as in the case of unilateral targeted pricing to derive the equilibrium pricing schedules, which are given below and illustrated in Figure 14.1(b).

$$p_1(x) = \begin{cases} t(1 - 2x) & \text{if } x \leq \frac{1}{2} \\ 0 & \text{if otherwise} \end{cases} \tag{14.3}$$

$$p_2(x) = \begin{cases} t(2x - 1) & \text{if } x \geq \frac{1}{2} \\ 0 & \text{if otherwise} \end{cases} \tag{14.4}$$

In this equilibrium, the market share effect disappears, as the competing firms share the market equally (see Figure 14.1(b)). The price discrimination effect is still present, as we can see from the above pricing schedules. However, it is not strong enough to outweigh the price competition effect. This is reflected in the fact that both firms' pricing schedules are uniformly below t, the price that both firms set in the benchmark case of no targeted pricing. As a result, both firms are worse off with a lower profit of $t/4$.

The fact that competitive targeted pricing could make practicing firms worse off is perhaps not very surprising in hindsight. As pointed out by Corts (1998, p. 321), 'Competitive price discrimination may intensify competition by giving firms more weapons with which to wage their war.' When competing firms all have the flexibility of targeted pricing, they can target each other's customers with great accuracy and efficiency, and they will all have to compete for each individual customer in the market. For that reason, the intensity of price competition increases to the detriment of both firms. Also for that reason, the early studies on competitive targeted pricing, such as Thisse and Vives (1988), Shaffer and Zhang (1995), Bester and Petrakis (1996), Chen (1997), Fudenberg and Tirole (2000), and Taylor (2003), have all come to the same conclusion, in varying

institutional contexts and with different models, that competitive targeted pricing will make practicing firms worse off.

This conclusion, of course, does not bode well for the future of targeted pricing. However, some reflection based on the analysis we have conducted so far tells us that this conclusion is not inevitable. This is because even if the flexibility compels firms to wrestle each other for each customer in the market, it does not give all firms an equal chance to win each wrestling match. In fact, if a firm is a 'Sumo wrestler' to start with, the flexibility may give it a chance to wrestle for each customer and win each customer, too. In that asymmetrical case, the market share effect can be enhanced and the price discrimination effect can be amplified so that the Sumo wrestler can be better off with targeted pricing than without. Then the question is what kind of firms might be Sumo wrestlers? Shaffer and Zhang (2002) address that question.

To illustrate the argument in that article, consider the following simple model where Firm 1 sells a high-quality product and Firm 2 sells a low-quality product. Suppose that all consumers are willing to pay V for a low-quality product, but $V + \theta$ for the high-quality product, where $\theta \in [0, 1]$ follows a uniform distribution. In other words, the willingness to pay for the low-quality product is constant, but that for the high-quality product varies among consumers. For simplicity, we still maintain the assumption that all costs are zero. Thus, if both high- and low-quality firms charge a single price, respectively p_l and p_h, we must have the payoff functions for both firms given respectively by $\pi_l = p_l(p_h - p_l)$ and $\pi_h = p_h(1 - p_h + p_l)$. From first-order conditions, we can easily determine equilibrium prices and profits. They are $p_l = \frac{1}{3}, p_h = \frac{2}{3}, \pi_l = \frac{1}{9}$, and $\pi_h = \frac{4}{9}$. In this equilibrium, the high-quality firm gets two-thirds of the market and the low quality firm one-third.

Now imagine that both firms can costlessly implement targeted pricing. In this case, it is easy to see that in equilibrium the high-quality firm can corner all consumers by charging θ, the premium that a consumer is willing to pay for a high-quality product. The low-quality firm will charge zero (the marginal cost) to all consumers, but sell to none. Here, the low-quality firm makes zero profit under competitive targeted pricing and the high-quality firm's profit is $\pi_h = \frac{1}{2} > \frac{4}{9}$. The high-quality firm is the Sumo wrestler!

The model used in Shaffer and Zhang (2002) is more general than this simple model suggests, and it incorporates the four main features of targeted pricing: individual addressability, personalized incentives, competition and costs of targeting (Blattberg and Deighton, 1991; Schultz, 1994). The model also allows customers to be loyal to different firms in a competitive context and introduces differences in the size of customer groups loyal to the respective firms.

Their analysis shows that a firm can benefit from competitive targeting after all, even if all consumers are perfectly addressable. The firm that commands a larger loyal following, i.e. that has more customers who are willing to pay a premium for its product, will be the one that benefits. This is because under competitive targeted pricing, a firm's expected payoff from consumers who are contested by competing firms comes only from the loyalty that these consumers have for the firm's brand. Although a firm is always able to outbid its competitor for the consumers who prefer its brand, targeted pricing dissipates all potential rents except for the premiums that contested consumers are willing to pay for a brand. Therefore, in an information-intensive marketing environment where a firm's customers are not anonymous to competition, the last line of defense in a firm's battle to acquire or retain a customer is the customers' relative preference for the firm.

In this context, one can readily appreciate the vital importance of individual (rather than average) consumer loyalty in the information age and hence the need for a firm to invest in enhancing consumer brand loyalty through quality, relationship, satisfaction, one-to-one marketing etc.

More recently, Liu and Zhang (2006) have shown that in a channel context, manufacturers are typically such Sumo wrestlers if they are in a position to dictate the wholesale prices for retailers. This is because, without targeted pricing at the retail level, a retailer can always commit to a single price markup and leverage the market coverage to get the manufacturer to charge a low wholesale price. In other words, the retailer can credibly threaten to raise its retail price to all end users automatically and sell to far fewer customers if the manufacturer charges a high wholesale price. To alleviate 'the double marginalization problem', the manufacturer will not charge too high a wholesale price. However, with the ability to implement targeted pricing at the retail level, the retailer loses such a leverage somewhat, as it will use variable markups to sell to end users. This means that the manufacturer can raise its wholesale price without worrying too much about worsening the double marginalization problem.

Of course, the existence of a Sumo wrestler, or asymmetry in competition, is a more obvious situation where a firm can benefit from competitive targeted pricing. A tougher question to answer is, whether in a situation where competing firms are equally matched and they all implement targeted pricing, can any of them become better off? This is a situation where the early literature has shown that the market share effect of targeted pricing disappears and the price competition effect dominates. More recently, however, Chen et al. (2001) have concluded that a firm, indeed all competing firms, can become better off in that situation.

Chen et al. (2001) note that targeted pricing in practice is imperfect in that competing firms can never distinguish different types of customers in a market with certitude.[3] For instance, a firm's own loyal customer may be mistaken for a switcher because of a firm's imperfect targetability. When firms compete with imperfect targetability, what they term the 'mistargeting effect' will be at work, which can help to moderate price competition to the benefit of all competing firms. More concretely, firms always want to charge a high price to price-insensitive loyal customers and a low price to price-sensitive switchers. Due to imperfect targetability, each firm will mistakenly classify some price-sensitive switchers as price-insensitive loyal customers and charge them all a high price. These misclassifications thus allow its competitors to acquire those mistargeted customers without lowering their prices and, hence, reduce the rival firm's incentive to cut prices. This effect softens price competition in the market, which benefits all competing firms. Of course, the magnitude of this effect will depend on targetability, and at a sufficiently high targetability, say perfect targetability, this effect can be weakened to the extent that neither firm can benefit from competitive targeted pricing.

Thus this study narrows down the conditions under which competing firms cannot benefit from competitive targeted pricing. There are two: firm symmetry and (sufficiently) high targetability. In addition, the article points out that imperfect targetability also

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[3] Interestingly, Chen and Iyer (2002) show that competing firms may even purposefully underinvest in their targetability so that they do not identify consumers perfectly.

qualitatively changes the incentive environment for competing firms engaging in targeted pricing. For instance, superior knowledge of individual customers can be a competitive advantage, but competing firms may all benefit from exchanging individual customer information with each other at the nascent stage of targeted pricing when firms' targetability is low. Indeed, under certain circumstances, a firm may even find it profitable to give away this information unilaterally. In terms of competitive dynamics, Chen et al. (2001) suggest that competitive targeted pricing does not doom small firms. In fact, targeted pricing may provide a good opportunity for a small firm to leapfrog a large firm. The key to leapfrogging is a high level of targetability or customer knowledge. In other words, small firms can also become the Sumo wrestler if they manage to gain a high level of targetability first.

The literature has also looked into behavior-based targeted pricing. When consumers with varying brand preferences are all passive recipients of a targeted price and they do not react when a firm takes away their surplus, firms can understandably become better off. However, when more and more consumers become aware of the practice of targeted pricing, many of them will start to react to the practice and behave strategically (Feinberg et al., 2002). For instance, a price-insensitive customer may fake being a price-sensitive customer by refusing to pay a high price. In that case, could targeted pricing still benefit a practicing firm? Villas-Boas (2004) offers an intriguing answer to that question.

Villas-Boas (2004) shows that if a firm targets a consumer based on the consumer's past buying behavior and the consumer knows about it, the consumer may start to behave strategically: choosing to forego a purchase today to avoid being recognized as a price-insensitive customer and hence to avail herself of a low price targeted at new buyers. Such strategic waiting on the part of consumers can hurt a firm both through reducing the benefit of price discrimination and through foregone sales. As a result, even a monopoly cannot benefit from targeted pricing.[4] A more recent study by Acquisti and Varian (2005) has come to a similar conclusion from the perspective of the revelation mechanism design, showing that it is never profitable for a monopolist to condition its pricing on purchase history, unless a sufficient number of consumers are not sophisticated enough to see through the seller's targeting strategy or the firm can provide enhanced services to boost consumer valuation subsequent to a purchase. In a competitive context, however, a firm cannot benefit from targeted pricing based on consumer purchase history at all.

Both studies have pointed to the difficulty in implementing price discrimination when consumers can anticipate future prices and make intertemporal adjustments. Without the benefit of price discrimination, targeted pricing will most likely make a firm worse off. However, just as there are reasons to believe that the existence of rational, forward-looking consumers can reduce the benefit of targeted pricing, there are also reasons to believe that their existence may enhance that benefit, too. For instance, in a two-period game, Fudenberg and Tirole (2000) show that a firm always has the incentive to offer discounts to the rival firm's customers who have revealed, through their prior purchase, their preference for the rival firm's product. In other words, once a firm figures out who is buying from whom, the firm always has an incentive to poach the rival's customers with a low price. Anticipating such a poaching discount, consumers should become less price

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4   In an earlier paper, Villas-Boas (1999) also shows that competing firms can all be worse off.

sensitive when they make their initial purchases, and this demand-driven effect should help to sustain high initial prices in the market. These high initial prices in turn should benefit competing firms.

On the supply side, the pursuit of targeted pricing can also generate some strategic benefits. In practice, firms frequently need to 'experiment' with their prices in order to gauge customer price sensitivities. A long stream of research on price experimentation shows that a firm may optimally experiment with its pricing decision at the cost of its current profit in order to enhance the informativeness of the observed market demand, and such information can help the firm to increase its future profit (Kihlstrom et al., 1984; Mirman et al., 1993). Interestingly, Mirman et al. (1994) subsequently show that such information always helps a monopolist, but may be detrimental to competing firms. Chen and Zhang (forthcoming) have recently extended the analysis to the case where firms may experiment with their prices not to gauge an uncertain market demand more accurately but to recognize the individual segments of a certain market demand for the purpose of implementing targeted pricing.

Chen and Zhang (forthcoming) show that the pursuit of customer recognition by competing firms based on consumer purchase history can moderate price competition in a market. This is because, as a firm strives to glean more accurate, actionable customer information for subsequent targeted pricing, it must seek to sell to a small number of customers, or to achieve 'exclusivity'. Exclusivity can come only with a high price, relative to the rival's price, such that not all consumers will purchase from the firm. Consequently, the firm has a strategic incentive to raise its price in its pursuit of customer recognition and price discrimination, to the benefit of all competing firms. In fact, Chen and Zhang (forthcoming) show that, paradoxically, a monopolist can become worse off because of the firm's quest for customer recognition, similar to Villas-Boas (1999), but competing firms can all become better off when they all actively pursue customer recognition. This is because competition amplifies what they term as 'the price-for-information' effect, as with competition the rise in one firm's price will, in turn, induce the increase in the rival's price and vice versa.

From all these discussions, we can draw one clear conclusion about targeted pricing: firms do not automatically benefit from this practice. There are mitigating factors, such as competition, strategic customers and mature markets that would prevent a firm from benefiting from this flexible, competitive form of price discrimination. Only those firms that command customer loyalty through product quality, branding, service, relationship marketing etc., and those that have an information advantage, are positioned to reap the benefits of targeted pricing.

3. What is the optimal targeting strategy?

To benefit from targeted pricing, a firm must target the right customers with the right incentives. Who are the right customers to target with discounts: a firm's own customers or the competition's? The literature has shed a good deal of light on this question.

Intuitively, to any firm, the customers who are currently buying from the competition are those who will deliver incremental sales if they are switched over. Therefore a firm should generate most incremental sales and get the most bang out of its discount dollars if it targets the competition's customers. It turns out that poaching with targeted pricing or the strategy of 'paying customers to switch' can be the optimal strategy in a competitive

equilibrium (Shaffer and Zhang, 1995; Chen, 1997; Fudenberg and Tirole, 2000). This is perhaps why magazines offer new subscribers' discounts, and why AT&T and MCI target each other's customers with switching checks.

However, some reflection here should reveal that this strategy cannot be optimal all the time or for all firms. For instance, MCI may very well benefit from poaching AT&T's customers, as AT&T had a bigger market share and hence more (marginal) customers to lose, but why should AT&T follow the same strategy by poaching MCI's customers? Doesn't it make more sense for AT&T to adopt the strategy of 'paying customers to stay'?

Shaffer and Zhang (2000) develop a model where consumers differ in their preferences and competing firms have different installed customer bases. In this model, firms cannot target individual customers, but only their own or the competition's customer base. From the analysis of this model, they come to the conclusion that the benefits of 'paying customers to switch' do not carry over to markets where competing firms are not equally matched. When firms are asymmetric, it can be optimal for a firm to use the strategy of 'paying customers to stay', but surprisingly the identity of this firm cannot be determined by firm size alone. Either the smaller firm or the bigger firm, but not both, may find it optimal to charge a lower price to its own customers. What determines a firm's targeting strategy is whether the firm's own customers are more price elastic than the rival's customers from the firm's own perspective.

To use the example in Shaffer and Zhang (2000, p. 413) to illustrate the point, suppose Pizza Hut and Domino's can both price-discriminate between own customers and the rival's customers. In this case, we might expect that for both firms, the customers located further away from a firm tend to be more price elastic and the customers located near a firm are more price inelastic. Then, regardless of its market share, each firm should pay customers to switch, poaching the customers on the competition's turf. On the other hand, suppose Domino's delivers, but Pizza Hut does not. Then, because Domino's delivers, customers close to Pizza Hut incur little cost to switch to Domino's, while the cost for Domino's customers (who live far from Pizza Hut) to switch to dining in at Pizza Hut is significant, so that few of them will switch even when offered a substantial discount. In this case, Pizza Hut should pay customers to stay, while Domino's Pizza should pay customers to switch.

The analysis in Shaffer and Zhang (2000) also generates three additional insights into how a firm should implement its targeted pricing. First, the firm with the higher regular price should offer the larger discount (e.g. AT&T will offer a larger discount than MCI). Second, the firm with the higher regular price always pays customers to switch. In other words, if a firm's optimal pricing strategy is pay to stay, it must have the lower regular price, too. However, the converse is not true: depending on parameters, the firm with the lower regular price may either want to pay customers to switch (MCI's strategy) or pay customers to stay (Sprint's strategy). Third, if each firm offers a discount to the same consumer group, the firm that is paying customers to switch will have the higher discount. This partially reflects the fact that it is more difficult to acquire the customers who prefer the rival's product in the first place.

Of course, this clear division of own versus competition's customers loses much of its significance when firms can identify and address each individual customer in the market and all consumers are potentially contested for by all competing firms. In that case, as

shown in Shaffer and Zhang (1995 and 2000), firms need to pursue both offensive and defensive targeting simultaneously: they must offer well-tailored incentives to pay customers to stay as well as to switch.

Concretely, in situations where the targeting cost is quite significant, firms should never target all consumers and they should only target consumers in a well-selected 'targeting zone' – the customers who can be profitably contested. Furthermore, they should target both their own and their competitors' customers in the targeting zone with a certain amount of randomness. As targeting costs decrease, firms should move away from offensive targeting to defensive targeting. The reason is that, as costs decrease, a firm has an incentive to target more of the rival's customers. However, the more it does so, the more consumers with stronger loyalty to the rival's product are targeted, so that offensive targeting becomes less effective in switching these consumers. This explains why the intensity of a firm's offensive targeting should level off as the cost of targeting decreases. In contrast, as a firm's more loyal customers are exposed to the rival's targeting due to a lower targeting cost, the firm faces increasingly more incentives to retain these profitable customers through defensive targeting. For that reason, the intensity of defensive targeting should pick up as the cost of targeting decreases.

One side effect of broad targeting is this phenomenon of massive customer churn, where a large number of customers switch to a less-preferred product because of targeted discounts. Shaffer and Zhang (2000) provide a fresh perspective on this phenomenon and suggest that customer churn need not always cause undue alarm. This is because customer churn results from firms taking chances with their loyal customers in order to capture as much consumer surplus from them as possible. From this perspective, it should not be eliminated. In addition, enhancing consumer loyalty should not always lead to churn reduction. This is because a higher consumer loyalty should also give competing firms more incentives to take chances with their loyal customers. The optimal way to manage customer churn is to engage in more defensive targeting (e.g. loyalty programs) as the cost of targeting decreases.

The cost of targeting and the strength of consumer preferences are but two out of many parameters to which firms should pay attention in adjusting their offensive and defensive targeting strategies. In a recent article, Fruchter and Zhang (2004) develop a differential game of competitive targeted pricing and show that a firm's optimal targeting strategies, both offensive and defensive, depend on its actual market share, the relevant redemption rate of its targeted promotions, customer profitability and the effectiveness of its targeted promotions. In the short run, a firm should operationalize its targeting strategies by adjusting its planned promotional incentives on the basis of the observed differences between actual and planned market shares, and between actual and planned redemption rates. In the long run, a focus on customer retention is not an optimal strategy for all firms in a competitive context. A firm with a sufficiently large market share should focus on customer retention (defensive targeting), whereas a firm with a sufficiently small market share should stress customer acquisition (offensive targeting). This is the case regardless of whether or not the firm is more effective in targeting its current customers. When market shares are more evenly divided, the optimal strategy for a firm is to focus more on customer acquisition than retention.

However, no matter how thoughtful and diligent a firm is in implementing its targeting strategy, it may still be doomed to fail if it ignores the customers' emotional reactions to

Table 14.1   Parameter estimates and effects tests

	Behaviorist	No switching	No loyalty	No betrayal	No Jealousy	Strong	None
		$s = 0$	$l = 0$	$b = 0$	$j = 0$	$bj = 0$	All $= 0$
s	0.2341	–	0.1434	0.2612	0.1875	0.2300	–
l	0.2040	0.1535	–	0.2416	0.1832	0.2030	–
b	0.1241	0.1950	0.1607	–	0.1679	–	–
j	0.1187	0.0796	0.0539	0.1626	–	–	–
p versus behaviorist	–	*	*	*	*	*	*
p versus strong	*	a	a	*	*	–	*
p versus none	*	*	*	*	*	*	–

Notes:
a As these do not nest the strong-rationality model, they are not directly comparable.
* $p < 0.001$.

Source: Feinberg et al. (2002), table 6.

targeted pricing. When more and more customers become aware of the practice of targeted pricing, a practicing firm cannot simply assume that consumers will calmly accept whatever price a firm imposes on them. Indeed, amazon.com learned the hard way, when it experimented in 2000 with using targeted pricing to sell DVDs and books, that 'Few things stir up a consumer revolt quicker than the notion that someone else is getting a better deal' (*The Washington Post*, 27 September 2000, p. A1). Amazon.com had a PR disaster on its hands when some consumers found out through Internet chat rooms and media reports that they were willfully subjected to higher prices than others who did not necessarily deserve a discount. Should a firm still use targeted pricing when consumers become aware? Feinberg et al. (2002) look into that question.

Through experiments, Feinberg et al. show that consumers care about not only the prices they themselves have to pay, but also the prices other groups of potential purchasers pay at the same firm. As shown in Table 14.1, by comparing statistical results for nested models, Feinberg et al. establish that targeted pricing in a competitive context can generate two behavioral effects among customers. First, 'consumers' preference for their favored firm will decrease if it offers a special price to switchers (the other firms present customers) and not to loyals (their own firm's present customers)'. Because of this, loyals are less likely to purchase from their favored firm. This is what they term as 'the betrayal effect', which has a sizable magnitude of 0.1241, as indicated in Table 14.1. Second, 'Consumers' preference for their favored firm will decrease if another firm offers a special price to its own loyals.' This is 'the jealousy effect', which also tends to reduce the likelihood of consumers' purchases at their favored firm. The magnitude of this effect is comparable to that of the betrayal effect (0.1187). However, the presence of the two effects in the marketplace does not mean that a firm should never use targeted pricing. All it means is that a firm should think through its strategies carefully and take advantage of those effects when they are favorable and mitigate them when they are not. In general, this

involves a firm recognizing these psychological effects and adjusting its targeting strategy from a more offensive-oriented to a more defensive-oriented strategy. This analysis was recently extended by the same authors to an environment of competitive price increase (Krishna et al., 2007).

4.   Does social welfare improve?

Many researchers have argued that targeted pricing can potentially harm social welfare (Shaffer and Zhang, 1995; Chen, 1997; Fudenberg and Tirole, 2000). This is because targeted pricing can distort consumer choices and motivate consumers to buy products that are less preferred. By implication, regulatory interventions might be warranted. However, this line of reasoning works only when the market size is fixed, firms do not make any other non-price adjustments because of targeted pricing, and strategic consumers do not exist in the market. In the real world, it would be difficult to find a market where all three conditions are present.

When the size of a market is expandable, it is easy to see why social welfare may improve due to competitive targeted pricing. Targeted pricing will allow all competing firms to lower their prices to 'marginal consumers' who would otherwise not purchase from any firm. The increased sales will increase social welfare, as firms will never sell at a price below its marginal cost and consumers will never purchase a product that does not provide a positive surplus.

Even if the size of a market cannot expand, social welfare can still improve if competing firms make long-term adjustments, say changing their product locations to compete for customers. Lederer and Hurter (1986) investigate that possibility in an elegant, but rather involved, model. Here, we can use a much simpler model to illustrate that possibility.

Consider again the simple Hotelling model that we used in Section 2. Instead of assuming that two competing firms are located at the respective ends of the Hotelling line, we now assume that two firms can choose their respective locations a and b on the line, where $0 \leq a \leq b \leq 1$, before they make their pricing decisions. In other words, firms know each other's locations before they make their respective pricing decisions. To make sure that for any pair of locations (a, b), the equilibrium exists for the pricing game, we further assume that consumer transportation cost is quadratic in the distance traveled. Thus, for a consumer located at $x \in (a, b)$, her utility from buying from Firm 1 and Firm 2 is given by $V - p_1 - t(x - a)^2$ and $V - p_2 - t(b - x)^2$ respectively. We shall maintain all other assumptions about the Hotelling model that we made in Section 2.

As D'Aspremont et al. (1979) have shown, if the two firms are restricted to uniform pricing, each charging a single price, the firms will choose their product locations respectively at 0 and 1 in equilibrium. In other words, the competing firms want to follow 'the principle of maximum differentiation', maximally differentiating themselves to moderate price competition in the market. In equilibrium, the two firms share the market equally, with the indifferent customers being located at $\frac{1}{2}$, and they each charge a price of t. In this market, given that the total demand is fixed, any change in social welfare will depend only on the total disutility (or the total transportation cost) that consumers in the market must suffer, which is $\frac{1}{12}t$.

Now imagine that in this market both firms adopt targeted pricing. Then, for any pair of locations (a, b), if the consumers located at x purchase from Firm 1, the price they are paying must be the premium they are willing to pay for Firm 1's product because of

their location, which is the difference in transportation costs between traveling to Firm 1 and to Firm 2. Thus competitive targeted pricing introduces the incentives for a firm to minimize the costs for consumers to travel to the firm in its location decision, as doing so will allow the firm to charge higher prices subsequently. Then competing firms will choose their locations at $\frac{1}{4}$ and $\frac{3}{4}$ respectively, the locations that will minimize the total disutility in the market. At these socially optimal locations, the total disutility in the market is only $\frac{1}{48}t$ and thus competitive targeted pricing improves social welfare by $\frac{3}{48}t$.

Intuitively, competitive targeted pricing will expose all consumers to competition, and what each firm can charge will depend on how happy individual consumers are about a firm relative to its rival. Therefore firms will have to make customers happy to keep themselves profitable and hence comes social welfare improvement. Clearly, this source of social welfare improvement is generalizable to other situations and even to many other decisions that competing firms have to make. For instance, social welfare also improves by the same amount if firms were to pursue 'the principle of minimum differentiation' prior to the introduction of targeted pricing (Zhang, 1995). It is also likely that because of competitive targeted pricing, a firm's service provisions (Armstrong and Vickers, 2001), marketing expenditures, quality improvements, market entry etc. may also be at the socially optimal levels or close to them (Choudhary et al., 2005; Ghose and Huang, 2006; Liu and Serfes, 2004, 2005).

Finally, as shown in Chen and Zhang (forthcoming), the existence of strategic consumers in the market can also provide an opportunity for competitive targeted pricing to improve social welfare. This is because targeted pricing allows a firm to price-discriminate and hence to discourage strategic consumers from waiting for or foregoing purchases. As a result, sales increase even if no new customer enters the market.

Of course, there could be other reasons on the cost side or demand side as to why targeted pricing may or may not improve social welfare. However, the literature seems to suggest, on balance, that competitive targeted pricing is social welfare improving. At the minimum, there does not seem to be any solid economic ground at this point to call for any regulatory intervention in targeted pricing.

5.   Conclusion

Competitive targeted pricing is a practice that is still evolving rapidly. The theoretical research in the past decade or so has generated some insightful perspectives, which allow us to peer into its future, notwithstanding the fact that the literature itself is also fast evolving. From these theoretical studies, we can perhaps draw three general conclusions about competitive targeted pricing.

First, the practice of targeted pricing has gone significantly beyond the traditional concept of price discrimination. With new information technologies becoming available, practitioners are redefining what is feasible in price discrimination and they have broken out of the confines of traditional practices. Looking into the future, we should not be surprised to see more and more sophisticated, unconventional schemes in targeted pricing. Indeed, as we are marching further into the Information Age, only practitioners' creativity, information technologies and consumer privacy concerns can limit the popularity and varieties of targeted pricing.

Second, unlike the conventional practices of price discrimination where the firm is thought always to benefit, competitive targeted pricing does not always benefit practicing

firms. The reason is that better customer targeting by competing firms exposes more consumers to competition. As a result, consumers may all benefit from competitive targeted pricing and social welfare may also improve.

Third, perhaps most interestingly, competitive targeted pricing rewards the 'right' firms with 'right' strategies. The conventional wisdom is that price discrimination benefits monopolistic firms who are deft enough to exploit their market power. In contrast, competitive targeted pricing forces competing firms to contest for, potentially, all consumers. Only the firms that have earned customer liking and command customer loyalty will have the upper hand in winning individual contests and hence benefit from targeted pricing. This cannot help but encourage firms to become more customer and market oriented in the long run.

These three conclusions bode well for the future of competitive targeted pricing. This means that the literature also needs to move forward to facilitate the coming of that future. On the empirical side, a pressing need is to document the benefits of targeted pricing to a firm with some actual performance data, even though from a theoretical perspective there is a compelling logic for such benefits to exist. On the theory side, much research is still needed to understand how targeted pricing may change and interact with other decisions in the marketing mix.

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