Unpriced Quality

Pascal Courty1

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Abstract: A monopolist deliberately charges the same price for differentiated products when high quality products are more likely to be assigned to low valuation consumers under uniform pricing. The argument can explain the use of ‘unpriced quality’ for concert tickets, movie theaters, and in other situations.

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1 Pascal Courty, Department of Economics, European University Institute, Villa San Paolo, Via Della Piazzuola 43, 50133 Firenze, Italy, Pascal.Courty@IUE.it.
Firms sometimes charge the same price for products of different qualities despite the fact that all consumers strictly prefer the high quality products. Examples include tickets for seats of different quality for sports and music events. Connolly and Krueger (2006) report that 43 percent of concerts for popular music in 2003 sell all seats in the house at the same price. Consumers also have to wait to enjoy the most popular attractions in theme parks (Passell, 1995). Restaurants do not charge extra to those consumers who come during peak hours or peak days. Movie theaters do the same and in addition they do not charge more for blockbusters (Einav and Orbach, 2007). In all these examples, quality is unpriced; that is, all products are sold at the same price independently of quality.

Can uniform pricing dominate price discrimination even when there is no additional cost associated with implementing price discrimination? Under price discrimination, the high qualities products end up in the hands of the consumers who value quality the most. Under uniform pricing, this may not be the case. Better products may be snapped by the ‘plugged in’ informed consumers, by consumers who can come on the first day of sale, or by lucky consumers. We take the rule that assigns products to consumers as given and show that uniform pricing can be optimal for some assignment rules. This is more likely to be the case for reverse monotone rules, which assign high quality products to low type consumers.

A corollary is that advertising mediums and distribution channels that increase the chance that low types get the high quality products are complement with uniform pricing. This could explain why some pop artists initially release concert tickets only to fans registered on the artist’s official website or only at the box office on a specific date. If correct, this explanation implies that price discrimination should be less common among those artists.
Despite the extensive economic literature on price discrimination, there is surprisingly little work on why firms sometimes abstain from price discriminating (Clerides (2004) and Stole (2008)). Anderson and Dana (2008) study when the optimal product line dominates selling a unique product quality. Instead, we take the product line as given and investigate whether the firm wants to sell differentiated products at different prices. Miravete (2007) shows that the return to complex tariffs may be low and implementation costs could explain the prevalence of simple product lines. We show that uniform pricing can dominate price discrimination even in the absence of implementation costs.

1-Example

Assume there are two types of consumer, two types of good, and each consumer can consume at most one good. Consumer \(t=\text{L,H}\) values \(v^t_s\) a good of quality \(s=\text{l,h}\) such that \(v^h_l>v^l_h\), \(v^H_l>v^L_h\), and \(v^H_l-v^H_h>v^L_l-v^L_h\). All consumers value the high quality good more, the high type values any quality more than the low type, and the high type values an increment in quality more than the low type. In addition, we also assume that \(v^H_l>v^L_h\). There are \(\phi \in [1/2,1]\) high type consumers and \(1-\phi\) low types. There is a unit continuum of goods. To simplify, we assume that the fraction of high quality goods is equal to \(\phi\) and we show later that the results generalize. Under price discrimination, the monopolist fully extracts the surplus of the low type consumers, \(p_l=v^L_l\), binds the incentive compatibility constraint of the high types, \(p_h=v^L_l+(v^H_h-v^H_l)\), and earns revenue

\[R^d=v^L_l+\phi(v^H_h-v^H_l).\]

Under uniform pricing, we assume that the goods are assigned according to an inverse monotone assignment rule: high quality goods are first assigned to low types. Under uniform pricing, the monopolist charges \(v^L_h\) and earns profits \(R^u=v^L_h\). (there are enough
high quality goods for the low types and high types buy since $v_H^">v_L^>h$. The gains from using uniform pricing instead of price discrimination, $\Delta R=R_u-R_d$, can be expressed as $\Delta R = v_L^>-v_L^->\phi(v_H^>-v_H^>)$. The monopolist uses uniform pricing when this expression is positive, that is, when

$$\frac{(v_H^>-v_H^>h)}{(v_L^>-v_L^>l)} < 1/\phi. \quad (1)$$

This condition is more likely to hold when there are not too many high types and when high types do not value quality too much relative to low types so that allocation inefficiencies are not too large. The intuition is that the reverse monotone assignment rule increases the willingness to pay of the low types more than what is lost from the high types under price discrimination. Next, we generalize the analysis to a continuum of consumers and goods and to arbitrary assignment rules.

2-Analysis

We take the standard model of second degree (quality) price discrimination (Mussa and Rosen, 1978) but assume that the set of products is given and that it is optimal to sell all products. This is the case in the motivating applications discussed earlier and it allows us to focus on revenue considerations alone. We argue later that the analysis can be generalized.

The monopolist has to price a given continuum of goods of quality distributed according to $G(q), q \in [q_l,q_h]$. There is a unit mass of consumer with type distribution $F(t), t \in [t_L,t_H]$. Consumer $t$ gets utility $U_t(q)-p$ from buying a good of quality $q$ at price $p$, where $U_t^>q>0, U_t^>qq<0,$ and $U_t^>qq>0$. The single crossing condition implies that it is efficient to

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2 The monopolist could earn more by charging more for low quality goods. This prediction is odd but does not change the main point of the paper. Quality is inversely priced!
assign higher quality goods to higher types: consumer $t^q(q)$ gets quality $q$ defined by $F(t^q(q)) = G(q)$.  

Under uniform pricing, consumers buy a lottery over quality. This is a general framework. Consumers may not know which product they will receive. But lotteries could also be degenerate in which case the assignment is deterministic. The probability density that type $t$ receives a good of quality $q$ is $\pi^t(q)$ with associated distribution $\Pi^t(q)$. The lotteries $\pi^t()$ are given. The assignment rule is such that market clearing takes place, 

$$\int_{h_t}^{H_t} \pi^t(q) dt = g(q), \text{ for all } q.$$  

In addition, we assume

$$\int_{h_t}^{h_t} \pi^t(q) U^t(q) dq \geq \int_{l_t}^{H_t} \pi^t(q) U^t(q) dq \text{ for all } t \quad (A1)$$

This condition guaranties that under uniform pricing all types participate if the lowest type does. To establish a benchmark, we assume that the assignment rule does not induce additional costs. This may be extreme but implementing price discrimination also induces costs and there is little one can say in general. So we leave this aside, and only compare the revenues under uniform pricing and price discrimination.

Under price discrimination, denote the pricing rule $p(q)$ and the profit maximizing assignment rule $t^{pd}(q)$. The participation constraint of consumer $t_L$, $p(q_L) = U^L(q_L)$, together with the consumers’ first order conditions, $U^t(q) = p(q)$, define the pricing rule as a function of the assignment rule

$$p(q) = U^L(q) + \int_q^{H_t} U^t(q) dq$$

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3 It is always optimal to sell all goods if $U^L(q_L) > (1-F(t))U^t(q(t))$ for all $t$ where $q(.) = (t^q)^{-1}(.)$. This condition implies that serving $[t^L,t^H]$ dominates serving only $[t^L, t^H]$ for any $t$.

4 This condition holds under a reverse monotone assignment if $U^t(q^*(t)) > U^L(q)$ for all $t$ where $q^*$ is defined by $G(q^*(t)) = 1-F(t)$.

5 Queuing, for example, imposes a cost if the marginal consumer has to be compensated for her time cost (Leslie and Sorenson, 2009).
Taking full derivatives in the consumer first order condition with respect to $t$ implies that $t^{pd}(q)$ is increasing, which together with full market coverage, implies $t^{pd}(q) = t^e(q)$. After integration, we obtain the revenue under price discrimination

$$R^{pd} = \int_{q_l}^{q_h} \left( U^L_{q}(q) + \int_{q_l}^{q} U'^{r}_{q}(x) \, dx \right) g(q) \, dq$$

and after integration by parts, we get

$$R^{pd} = U^L_{q}(q) + \int_{q_l}^{q_h} U'^{r}_{q}(q)(1 - G(q)) \, dq .$$

Under assumption A1, the optimal uniform price is $\int_{q_l}^{q_h} \pi^L(q) U^L_{q}(q) \, dq$ with profits

$$R^u = \int_{q_l}^{q_h} \pi^L(q) U^L_{q}(q) \, dq$$

Uniform pricing weakly dominates price discrimination if and only if $R^u \geq R^{PD}$

$$\int_{q_l}^{q_h} \left[ (1 - \Pi^L(q)) U^L_{q}(q) - (1 - G(q)) U'^{r}_{q}(q) \right] \, dq \geq 0 . \tag{2}$$

This establishes our main result which we now discuss. Under a reverse monotone assignment rule the lowest type gets the highest good for sure, $\Pi^L(q)=0$ for all $q<q_h$, and condition (2) becomes

$$\int_{q_l}^{q_h} \left( U^L_{q}(q) - (1 - G(q)) U'^{r}_{q}(q) \right) \, dq \geq 0$$

which is the continuous version of (1). A sufficient condition for uniform pricing to be optimal is

$$\frac{1 - \Pi^L(q)}{1 - G(q)} \geq \frac{U'^{r}_{q}(q)}{U^L_{q}(q)} \text{ for all } q \in [q_l, q_h]. \tag{3}$$

Again, this condition is equivalent to condition (1) in the two type case with an inverse monotone assignment rule. In general, it is less likely to hold if there is a large fraction of high types (first-order-stochastic-dominance shift in $G(.)$), if the assignment rule is closer to reverse monotone (first-order-stochastic-dominance shift in $\Pi^L(.)$), and if higher types
are not willing to pay much more than the lowest type for incremental units of quality so that inefficiencies are not too high (the ratio on the right hand side of inequality (3) is small). Any assignment rule away from reverse monotone reduces the chance that uniform pricing is optimal. For example, under a random assignment rule, $\Pi^t(q)=G(q)$, condition (2) is violated, and price discrimination is preferred.

In a market with no consumer heterogeneity at all, price discrimination and uniform pricing are equivalent. Price discrimination dominates uniform pricing when there much consumer heterogeneity (condition (2) is violated). Therefore, uniform pricing can be strictly optimal when there is some consumer heterogeneity but not too much. When uniform pricing is optimal, the assignment of goods is inefficient. Total consumer welfare decreases since overall welfare decreases and firm revenue increases. Some consumers, however, may be better-off.\(^6\)

3-Conclusions

The price discrimination literature has overlooked the possibility to deliberately sell an exogenously given set of vertically differentiated products at the same price. This paper makes three points:

1. We show that not pricing quality can dominate price discrimination.
2. This depends on how high quality goods are assigned under uniform pricing.
3. A seller who uses uniform pricing strictly prefers advertizing mediums, distribution channels, and other means that help assigning high quality goods to low types.

We assumed that the set of goods was given and focused on the monopoly revenue maximization problem. The analysis could be extended to endogenous product qualities.

\(^6\) This will be the case if $\int_{t(v)}^{t}\left(\pi^t(q)U^t(q) - \pi^t(q)U^t(q)\right) dq > U^t(q(t)) - p(q(t))$ where $q(.)=(t^t)^{-1}(.)$. 

Clearly, the results hold for cost functions that sufficiently constrain the monopolist’s choice of product line, so that the profit maximizing product line satisfies condition (2).

References


