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Comment on "Pricing a Product Line"

This paper presents an elegant and clever method for calculating profit-maximizing prices for each of several related products. The intention of the authors seems to be normative, that is, to prescribe a procedure for managers involved in making such pricing decisions. They are not concerned with explaining the observed behavior of or the relationships among such prices. Nevertheless, to be useful for setting prices, the model should capture the important aspects of the product-line environments being modeled.The main point of this comment is to argue that the model analyzed omits some of these important features.

First, it seems to me that the model is really about optimal, nonlinear pricing of a *single* product (really a service) rather than of a product *line*. The product line is a series of machines all of which perform the same service. The machines differ in only one dimension, namely the range of usage rates over which the particular machine provides the lowest average cost of performing the service (the authors suggest thinking of Xerox machines as the archetypal example). The problem analyzed is how to charge for the services performed given that the seller pays all operating costs and retains ownership of the machine. Thus, essentially, the problem is how much to charge for each usage rate (e.g., per copy) given that the seller must supply the requested level of service using the cheapest machine for that purpose. This is simply an optimal, nonlinear pricing problem where the cost of production is the lower envelope of the cost curves of the various machines (a piecewise linear function in this model). Thus the model provides little guidance for managers pricing a true product line, one in which the products differ over several quality dimensions. Even the authors' archetypal example, copiers, can produce higher or lower quality copies, produce them faster or slower, provide two-sided copying, reduction, sorting, color, and so forth.

Another feature of the model is that it purports to take account of competition from other suppliers. This is an important consideration

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but is addressed only in a very limited way. In particular, the analysis covers only the case in which the seller whose problem is being analyzed never competes with another seller for the same range of usage rates. To put it another way, it is *assumed* that two sellers never offer the same machine. Thus competition in this model is for customers with usage rates just above or below the range which a seller's machines can efficiently produce. It is shown that the seller's optimal policy in this case is to behave as if he also offered his competitor's machines but the cost functions for those machines were equal to the revenue functions being used by the competitor. This would seem to rule out competition for customers with usage rates outside the efficient range of a seller's machines since, following the above rule, he would have to charge more than his competitor for the same service. Moreover, no analysis of which machines one should offer is included. The result is that no useful analysis of the effects of competition is provided.

Two other observations tend to suggest that important elements have been left out. First, since the optimal revenue function for the service is concave, no user ever uses the services of two or more machines, either of the same or different capacity. This is clearly at variance with what we observe, at least for Xerox machines, the canonical example. It suggests that peak-load problems, congestion problems, and uncertainty are probably important features of the environment. A second observation is that the revenue functions for pricing some "product lines" are not concave. The pricing structure for telephone message units, for example, is that one pays a fixed cost, say $F(n)$, for the first n or fewer message units regardless of how many are actually used (F is increasing and concave) and a marginal price, say p, for each unit in excess of n. The number n is chosen by the customer from a small, finite menu (e.g., $n = 0, 60, 90, 120, \infty$ per month). The result is to encourage customers to forecast their usage accurately and inform the supplier of that forecast. This suggests again that uncertainty is important and also that costs of switching from one "machine" to another are positive and significant.

To conclude, let me say that, despite the above criticisms, I found the paper interesting, well written, and clever. I find it remarkable that the authors were able to provide a way of explicitly calculating the optimal, nonlinear pricing structure for the case of a piecewise linear cost function. I do think it important, however, especially when one's purpose is normative, to demonstrate that the model captures the important features of the modeled environment. In my opinion, this can best be done by showing that the implications of the model are generally consistent with any observed empirical regularities of the relevant phenomena (nonlinear pricing structures in this case).