

Quality Segmentation in Spatial Markets: When Does Cannibalization Affect Product Line Design?

Preyas S. Desai

The Fuqua School of Business, Duke University, Durham, North Carolina 27708

preyas.desai@duke.edu

Abstract

Durable goods manufacturers often design product lines by segmenting their markets on quality attributes—attributes that exhibit a “more is better” property for all consumers. Since products within a product line are partial substitutes, and consumers can self-select the products they want to purchase, multiproduct firms have to carefully consider the cannibalization problem in designing their product lines. Existing research has analyzed the cannibalization problem for a monopolist who faces consumers who differ in their quality valuations. If lower-quality products are sufficiently attractive, higher-valuation consumers may find it beneficial to buy lower-quality products rather than the higher-quality products targeted to them. That is, lower-quality products can potentially cannibalize higher-quality products. The cannibalization problem forces the firm to provide only the highest-valuation segment with its preferred (efficient) quality. All other segments get qualities lower than their preferred (efficient) qualities. When the cannibalization problem is very severe, the firm may not serve some of the lowest-valuation segments.

However, not much is known about how and when the cannibalization problem affects product line design in an oligopoly. Also, consumers may differ not only in their quality valuations but also in their taste preferences. The objective of this paper is to fill these gaps by examining whether the cannibalization problem affects a firm's price and quality decisions in a model with consumer differences in quality valuations, as well as in their taste preferences, in both monopoly and duopoly settings. The paper addresses questions such as the following. With both types of consumer differences, should a firm, even a monopolist, provide efficient quality only to the top segment? Are there conditions under which other segments can also get their preferred quality levels? If so, how do consumer and firm characteristics affect the likelihood of different segments getting their preferred qualities? How does competition affect the firm's choice of qualities?

I develop a model in which the market is made up of two segments, with one segment valuing quality more than the other. Consumers within each segment are distributed over Hotelling's (1929) linear city. Consumers in the two segments can have different taste preferences (transportation costs). Firm locations in the two segments may also be different.

The paper begins with an analysis of the monopoly case. I find that when both segments are fully covered, the standard self-selection results of the high-valuation segment getting its preferred quality and the low-valuation segment getting less than its

preferred quality do hold. Interestingly, when both segments are incompletely covered, under some conditions, the monopolist's price and quality choices are not determined by the cannibalization problem. In these cases, the monopolist finds it optimal to provide each segment with its preferred quality. Thus, the equilibrium quality levels in a second-degree price discrimination situation resemble the third-degree price discrimination solution. I characterize the relevant conditions in terms of consumer characteristics.

I then consider the case of two firms competing in the market, each offering two products—one for the high-valuation segment and the other for the low-valuation segment. Here also both types of outcomes are possible, depending on consumers and firm characteristics. Under some conditions, the cannibalization problem does not affect the firms' price and quality choices, and each firm provides each segment with that segment's preferred quality. Each firm finds it optimal to serve both segments. When these conditions do not hold, only the high-valuation segment gets its preferred quality. I interpret the conditions necessary for these results to exist in terms of characteristics of the consumers and the firms.

An interesting insight from the analysis is that as the taste preferences of the low-valuation segment become weaker (their “transportation cost” becomes lower), the more intense competition in the low-valuation segment makes it more attractive for the high-valuation consumers to buy the products meant for the low-valuation segment. This worsens the cannibalization problem, and the low-valuation segment may not get its preferred quality. On the other hand, when the taste preferences of the high-valuation segments are sufficiently weak, more intense competition in the high-valuation segment reduces that segment's incentives to buy the product meant for the low-valuation segment. This mitigates the cannibalization problem and makes it more likely for the low-valuation segment to get its preferred quality.

Similarly, when firms are less differentiated in the low-valuation segment, stronger competition between the firms makes the cannibalization problem worse, and the low-valuation segment may not get its preferred quality. When the differentiation between the firms is sufficiently weak in the high-valuation segment, the high-valuation segment is more likely to be better off buying the product meant for it. As the high-valuation segment's incentives to buy the lower-quality product are reduced, the low-valuation segment is more likely to get its preferred quality.

(Cannibalization; Product Line Design; Price Discrimination; Vertical Differentiation; Horizontal Differentiation)