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Do tying, bundling, and other purchase restraints increase product quality?[☆]

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ABSTRACT

Tying, bundling, minimum purchase requirements, loyalty discounts, exclusive dealing, and other purchase restraints can create stronger incentives for firms to invest in product quality. In our first example, the firm sells a durable experience good and a complementary non-durable good to a representative consumer. Tying shifts profits from the durable to the non-durable good, making profits more sensitive to the consumer's experience. In our second example, the firm sells a single experience good to consumers with heterogeneous demands. Minimum purchase requirements screen out the low-volume consumers who would otherwise free ride on the superior monitoring of the high-volume consumers. The examples illustrate that purchase restraints can increase both firm profits and consumer surplus by making firm profits more sensitive to consumer experience, either directly by giving the consumer more control over the stream of profits or indirectly by constraining consumers to monitor more intensively.

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1. Introduction

Why do firms constrain consumer choice by physically bundling their products together or by contractually mandating their products be jointly purchased? In the law and economics and industrial organization literatures, most research on product bundling and product tying focuses on price discrimination or market foreclosure.¹ In antitrust litigation, however, firms often defend these practices as reducing costs

or enhancing their ability to control product quality and maintain strong reputations in the marketplace.² While academics widely acknowledge the existence of economies of scope that lower costs or increase observable quality, the academic literature on the potential for bundling and tying to increase unobservable quality (i.e., experience goods) is relatively small.³ In this paper, we describe the ways in which purchase restraints – including tying, bundling, quantity forcing, volume discounts, and loyalty programs – can create stronger incentives for firms to invest in product quality, and can increase both profit and consumer surplus.

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¹ See Rey and Tirole (2007) and Nalebuff (2008) for overviews of the literature. Famous lawsuits on metering and price discrimination include Motion Picture Patents v. Universal Film, 243 U.S. 502, 518 (1917) and Morton Salt Co. v. G.S. Suppinger Co., 314 U.S. 488, 490 (1942). Cases on market foreclosure include United States v. Microsoft Corporation 253 F.3d 34 (D.C. Cir. 2001).

² Hilti, a leading producer of nail guns and supplies, defended its bundling practices saying that the use of a competitor's nails would “give rise to uncertain fixing reliability and, consequently, safety risks in load bearing applications.” Press Release, Hilti Ltd., Warning: Profix Nails Used in Hilti DX Tools (June 30, 1988). See Case T-30/89, Hilti AG v. Comm'n, 1991 E.C.R. II-1439. See the more general discussion in Kaplow (1985, p. 545 at N. 121), Brief for Appellants at 13, 34, International Salt Co. v. United States, 332 U.S. 392 (1947); Brief for Appellants at 8–16, International Bus. Mach. Corp. v. United States, 298 U.S. 131 (1936); Brief for Appellants, Vol. 1, at 221–26, United Shoe Mach. Co. v. United States, 258 U.S. 451 (1922); Brief for Appellees at 13, Henry v. A.B. Dick Co., 224 U.S. 1 (1912).

³ See Kaplow (1985, p. 545 at N. 121), Nalebuff (2008, p. 1887), Katz (1989, p. 685–689), Bork (1978, 379–381). To the best of our knowledge, the only academic papers on this topic are Schwartz and Werden (1996), Iacobucci (2003), and our related papers, Dana and Spier (2009, 2014).

Specifically, consider the product quality decision of a single firm that sells experience goods to consumers.⁴ Since consumers do not directly observe the quality of the firm's products at the time of sale, the firm is tempted to produce and sell a lower quality product to reduce its production costs. Consumers receive imperfect private signals that are correlated with the quality of their purchases, and learn gradually about the firm's effort decisions. If the consumers purchase the good only once, or purchase it relatively infrequently, then high quality cannot be sustained in equilibrium. But with more frequent purchases, the firm has less incentive to shirk and high quality may be sustained (Klein and Leffler, 1981). Using two simple examples, we illustrate that tying, bundling and other purchase restraints can have a similar effect to increasing purchase frequency and can help the firm to sustain high quality in a broader range of circumstances than could be achieved otherwise.

In our first example, the firm sells two products, a durable experience good that is purchased infrequently, and a complementary non-durable good that is purchased in every period, to a representative consumer. The non-durable good is of known quality, and is also available from a competitive market. Absent tying, the incentive for the firm to cheat and reduce the quality of the durable good is strong: since the consumer purchases the durable good infrequently, the reputation mechanism works poorly. If the firm ties the products, it charges a lower price for the durable good but a higher-than-market price for the complementary non-durable good. Through this scheme, bundling or tying creates a stream of rents that will accrue to the firm if and only if the consumer remains satisfied with his or her purchases.⁵

In our second example, the firm sells a single non-durable good to a population of consumers with heterogeneous demands.⁶ Some consumers would like to purchase large volumes, while others would prefer to purchase small volumes. The consumers who purchase large volumes are more effective at monitoring the firm, since they have more opportunities to detect low quality. Consumers who demand small volumes monitor less effectively, and free ride on the monitoring done by the high-volume consumers. Importantly, we show that the presence of too many of these free-riding consumers erodes the firm's incentives to invest in product quality and makes the provision of a high quality product unsustainable.⁷ Minimum purchase requirements, quantity forcing, and other purchase restraints serve to exclude these low-volume consumers from the market, increasing the average speed of consumer learning and the firm's incentive to invest.⁸

2. Using purchase restraints to create a stream of rents

To illustrate the idea of this section, suppose that a firm produces two goods: a long-lasting printer and single-period-use ink cartridges.

⁴ Our examples are also useful for understanding restraints when an upstream firm is selling to multiple independent downstream firms (see Katz, 1989, and Rey and Verge, 2010 for general discussions of vertical restraints).

⁵ See Schwartz and Werden (1996) for a closely related signaling theory. Alternatively, the firm may create a stream of rents by leasing the durable good. As here, leasing converts the profit on an infrequently purchased durable to a frequently purchased non-durable. This empowers consumers to punish the firm when quality is low, which in turn creates stronger incentives for the firms. A returns contract, or unconditional warranty, in which the consumer receives a refund upon the return of the durable is another alternative.

⁶ The example here is simpler, but more stylized, than the model in Dana and Spier (2014), which considers a more general environment with multiple products.

⁷ Consumers are not choosing how much to invest in monitoring. Instead monitoring is just a byproduct of consumption. But monitoring can still be thought of as a public good. However if there were only one consumer, that consumer would internalize the impact of his or her purchase decision on the firm's incentives. When consumers are small they free ride in the sense that they ignore the impact of their consumption choice on the firm's incentives to produce a high-quality product.

⁸ In situations where a firm sells multiple experience goods, these insights imply that product-line forcing intensifies the monitoring by consumers and speeds the rate of consumer learning, providing additional incentives for high quality. See the more general multiproduct model in Dana and Spier (2009, 2014).

The printer is an experience good in the sense that its quality is not directly observed by consumers at the time of sale. The ink cartridge, however, has known quality and is supplied by a competitive market. Absent bundling or tying, consumers are free to buy ink cartridges in a competitive market at marginal cost. The moral hazard problem is potentially severe in this environment. Since consumers purchase printers infrequently, the firm has an incentive to cheat and reduce the quality of the printers. Thus, absent bundling, the reputation mechanism is ineffective. With bundling, however, the firm has a much stronger incentive to produce high-quality printers. By requiring consumers to purchase ink from the firm at a marked-up price, the firm gives consumers a tool with which to punish the firm for producing low-quality printers. When a customer discovers that the quality of the printer is low, the consumer will rationally cut back on ink purchases and deprive the firm of its profit margins.

In addition to printers and ink, there are many examples of firms that sell both durable experience goods and complementary non-durables products and appear to earn higher markups on the tied non-durable. Razors are often sold along with higher markup razor blades.⁹ Computer hardware can be bundled with software (particularly video consoles and video games) and hardware accessories (power cords and adapters). And many durable goods are loosely "bundled" with service agreements (often, consumers face penalties for obtaining service from third parties). Historically, there have been many antitrust lawsuits that involved the tying of a consumable product or service to that of a durable good, including the well-known IBM tabulating cards case.¹⁰

Consider a simple game with a single firm and a representative consumer (and a competitive fringe that exists absent bundling). The firm produces two products: a durable experience good A and a non-durable good B . The consumer derives no value from product A without consuming product B , and vice versa. The firm's cost of producing a high-quality durable good is c_A , and the cost of producing a low quality durable is 0 . The unit cost of producing the non-durable good, which is of known quality, is c_B . We let the prices be p_A and p_B , respectively. If the consumer owns a high-quality durable good, the consumer's demand for the non-durable good in each period is given by $D(p_B)$.¹¹ If the consumer owns a low-quality durable good, their expected value of consumption of the non-durable good is zero, or negative. This assumption implies that a low-quality good is not sold when the high-quality good cannot be sustained and is made for convenience and notational simplicity.

If the firm ties its products, consumers who buy the durable from the firm must also buy the non-durable from the firm, even if it is available at a lower price elsewhere. However, consumers are unconstrained in the amount of the non-durable they consume. This model of tying is often called "metered tying" because the level of consumption of the non-durable good can serve as a meter for how much consumers value the durable good (see for example Elhaage and Nalebuff

⁹ An alternative explanation for this type of tying is that it facilitates price discrimination, and this explanation would also predict that tying leads to higher markups on the tied non-durable and lower markups on the durable. It is not clear how one would empirically distinguish between these motives for tying.

¹⁰ In the 1930s, IBM was prosecuted for its practice of tying paper tabulating cards to that of tabulating machines and General Motors was prosecuted for its requirement that its automobile dealers only use genuine General Motors parts in the repairs of its cars. *IBM v. United States* (298 U.S. 131 [1936]). *Pick Mfg. Co. v. General Motors Corp. et al.* (80 F. 2d 641 [7th Cir. 1935]). IBM and GM argued that competitors would supply lower quality non-durables, damaging the reputation for their durable product, which obviously differs from our simple stylized example. In 1991, Hilti, a market leader in building materials, was fined 6 million Euros for tying the sales of nails and cartridge strips to the sales of its nail guns (see references in footnote 2 above). Around the same time, the Van den Bergh (VB) Foods' practice of giving ice cream freezers to retailers for free but requiring them to stock only VB ice cream constituted illegal tying. (See European Commission: *Van den Bergh Foods Ltd, Cases IV/34.073, IV/34.395 and IV/ 35.436; Case T-65/98 Van den Bergh Foods Ltd v Commission* [2003] ECR II-4563.)

¹¹ Note that the per-period demand function depends only on the price of the non-durable good, p_B , because the price of the durable good, p_A , is sunk.

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