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# An Antitrust Analysis of Bundled Loyalty Discounts*

**by**

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## Abstract

Consider a firm that is a monopolist in one market and a perfect competitor in another. What are the effects of that firm introducing bundled loyalty discounts? What antitrust legal analysis best applies? It is shown that bundled loyalty discounts may raise or lower consumer welfare and total welfare. To analyze such discounts as predatory pricing is incorrect; they are best viewed as tie-in sales. Existing tests for whether bundled loyalty discounts are anticompetitive are flawed. We present simpler tests that are on stronger conceptual ground, and apply them to the *SmithKline* case.

## I. Introduction

Bundled loyalty discounts have recently received considerable attention in antitrust circles in light of *LePage's, Inc. et al. v. 3M Company*. Up to now, the practice of bundled rebates has received comparatively little scholarly and judicial scrutiny. Indeed, there have been only two other litigated cases that have focused squarely on these practices, *SmithKline Corp. v. Eli Lilly & Co.* and *Ortho Diagnostics Sys., Inc. v. Abbott Lab, Inc*. *Virgin Atlantic Airways Ltd. v. British Airways* involved similar practices, but the district court found allegations of anticompetitive behavior to be unsupported by fact. *LePage's* provides a good background for the issues involved.

The facts in *LePage's* begin with the very strong brand name of Scotch tape, a 3M product. Most retail merchants believed that they had to offer Scotch tape. Until the early 1990's, 3M's share of the U.S. market for transparent and invisible tape exceeded 90%. Starting in the early 1990's, however, 3M's share began to erode with the rise of office superstores, such as Staples and Office Depot. These retailers sold products, including tape, under their own names as private labels. LePage's dominated the growing private label segment, with an 88% market share in 1992. Its share of overall tape sales, however, was only 14%.

3M responded by adding a private label of its own, under the Highland name. 3M's entry involved the use of a bundled rebate program that "offered discounts to certain customers conditioned on purchases spanning" multiple product lines, with the size of the rebate depending on the extent to which the customer met growth targets established by 3M.

3M's bundled rebates apparently proved successful in shifting a large fraction of private label tape business to 3M. In 1992, LePage's filed a four-count antitrust suit against 3M that was ultimately narrowed to a monopolization claim under Section 2 of the Sherman Act.[1] LePage's argued that it was foreclosed from selling private label tape because it could not cover its costs and still compensate customers for the rebates lost on *other* products in the discount program when the customer bought private label tape from LePage's instead of from 3M.

The legal strategy of the defendant, 3M, was to compare price to cost and use the case law of predation. 3M advocated the use of the *Ortho* test, in its appellate filings. In *Ortho*, the defendant offered bundled rebates on products,[2] some of which were competitive and some of which were monopoly products due to patents. The Court allocated the discount from the whole bundle to the competitive product in question and compared that globally discounted price to the defendant's cost. This approach effectively applied *Brooke Group* to the analysis of bundled rebates. If the discount-adjusted price of the competitive product exceeds its cost, the bundled discount is not anti-competitive.

The great interest in *LePage's* probably stems from the facts that bundled rebates are a widespread business practice. Until *LePage's*, the *Ortho* test was an accepted way of analyzing bundled discounts. The Court of Appeals' decision in *LePage's*, however, leaves matters in doubt. To quote the Department of Justice:

[1] One of the four counts was exclusive dealing. The jury found against LePage's on this claim.
[2] In the context of these cases, bundling refers to a set of discount prices that are only available if the relevant products are bought largely or entirely from the dominant multi-product firm. This differs from the standard usage in economics, where bundling refers to the sale of a set number of units of various goods.

> …The court of appeals was unclear as to what aspect of bundled rebates constituted exclusionary conduct, and neither it nor other courts have definitively resolved what legal principles and economic analyses should control.[3]

Employing a binding loyalty discount plan imposes switching costs on customers because a customer that shifts some purchases to a rival seller pays a higher unit price for the quantity still purchased from the incumbent. In *VAA/BA*, Virgin Atlantic proposed an incremental sales test to judge the legality of a loyalty discount plan. This test compares the competitor's incremental revenue from making those new sales to the customer to the competitor's incremental cost. Because the competitor must compensate the customer for the switching cost, net incremental revenue may be forced below incremental cost. In such a setting, "incremental" competition is unprofitable and is deterred by the loyalty discount plan. The *VAA/BA* test simply checks whether net incremental revenue exceeds incremental cost, and if it does, the loyalty discount plan is presumed legal. Like *Ortho*, this test analyzes bundled rebates using predation case law.

The academic economics literature on bundled rebates is rather sparse. Bundling for the purpose of price discrimination has a large literature, but usually in a monopoly setting. Nalebuff (2004a),[4] for example, writes extensively on how bundling can be used to reduce competition. Discounts that apply to every unit purchased has a smaller literature. Kolay, Shaffer, and Ordover (2004) examine a monopolist's use of all-units discounts on

[3] *Brief for the United States as Amicus Curiae*, 3M Company FKA Minnesota Mining and Manufacturing Company, Petitioners, and LePage's Incorporated, et al. On Petition for a Writ of Certiorari to the United States Court of Appeals for the Third Circuit, at 8.
[4] Barry Nalebuff, "Bundling as an Entry Barrier," 119 QUARTERLY JOURNAL OF ECONOMICS 159 (2004).

a single product, and compare them to menus of two-part tariffs.[5] Greenlee and Reitman (2004) analyze loyalty discounts, both with and without bundling.[6] In a duopoly differentiated products setting in which both firms can introduce loyalty programs, they show that firms pass the *VAA/BA* test in equilibrium. Thus a firm that fails the test must have goals other than short term profit maximization. In a setting similar to *LePage's*, they show that the introduction of bundled rebates causes standalone prices to rise. The welfare effects of bundled rebates in Greenlee and Reitman (2004) are ambiguous, since their models allow for price discrimination across customer types.[7] See also Carlton (2001) and Tom, Balto, and Averitt (2000).[8] Nalebuff (2004b,c) together contain results similar to Theorems 1 and 2 below.[9]

From the standpoint of antitrust enforcement, it is unclear what body of case law best applies. The *Ortho* test suggests that predation may be the way to analyze bundled rebates. The *VAA/BA* incremental test is in that spirit too. In *LePage's*, 3M argued vigorously in its appellate briefs that its discounts were legal under *Brooke Group* because even its discounted prices exceeded cost, an assertion not challenged by the plaintiff.

[5] Sreya Kolay, Greg Shaffer, and Janusz A. Ordover, "All-Units Discounts in Retail Contracts," 13 JOURNAL OF ECONOMICS & MANAGEMENT STRATEGY 429 (2004).
[6] Patrick Greenlee and David Reitman, "Competing with Loyalty Discounts," EAG Discussion Paper 04-02, February 2004.
[7] Their model includes small customers that are not eligible for a loyalty program. Small customers are always harmed by the introduction of a loyalty program, but this loss may be balanced by surplus gains to large customers.
[8] Dennis Carlton, "A General Analysis of Exclusionary Conduct and Refusals to Deal – Why *Aspen* and *Kodak* are Misguided," 68 ANTITRUST LAW JOURNAL 659 (2001). Willard K. Tom, David A. Balto, and Neil W. Averitt, "Anticompetitive Aspects of Market-Share Discounts and Other Incentives to Exclusive Dealing," 67 ANTITRUST LAW JOURNAL 615 (2000).
[9] Barry Nalebuff, "Bundling as a Way to Leverage Monopoly," draft 10/02/04, and "Exclusionary Bundling," undated draft.

However, because the intent of the bundling is to induce customers to buy more than one product from a single seller, perhaps tying is the best way to look at bundled rebates. Indeed, the court of appeals suggested this in *LePage's*, but went no further. It is worth noting that in *LePage's* and in *Ortho*, the firm offering the bundled rebates included in the program a product over which it had either a monopoly (*Ortho*, due to patents) or a very strong brand name (Scotch tape, in *LePage's*). Monopoly products within the bundle, then, may play the role of tying products.

To summarize, this paper provides preliminary answers to two main questions. First, what is the correct legal framework to use in the antitrust analysis of bundled rebates? Second, how can one distinguish between bundled rebates that benefit consumers from ones that do not?

Our analysis leads to the following conclusions.

- Bundled rebates are best viewed as a form of tying or exclusive dealing, not as a form of predatory pricing.

- The *Ortho* and *Virgin Atlantic* tests are unlikely to be generally useful.

- Bundled rebates can either raise or lower consumer welfare. In either case, equally efficient competitors can be foreclosed.

- Under some conditions, simple price comparison tests exist that can distinguish bundled rebates that raise consumer welfare from those that lower it.

- These tests, applied to *SmithKline*, show that the Court's decision was correct, but that its reasoning was flawed.

## II. The Model

Firm 1 has a monopoly in market A and is one of many perfect competitors in market B. For each consumer, demands are economically independent and described by $Q_A(P_A)$ and $Q_B(P_B)$, where both are strictly downward sloping. As in *LePage's*, firm 1 signs a contract with each consumer, or fails to do so. The contract specifies the bundled rebates. Absent signing a contract, the consumer buys *A* at the standalone price and *B* at marginal cost.

Let $CS_i(P_i)$ be consumer surplus, where $CS_i'(P_i) = -Q_i(P_i)$, $i = A, B$. Denote by $\hat{P}_A$ the choke price for market *A*, given by $\inf\{P_A \mid Q_A(P_A) = 0\}$. Denote by $P_A^*$ and $P_B^*$ the standalone monopoly prices in markets *A* and *B*. Firm A has a constant marginal cost $c_A$ for good *A* and all firms have a constant marginal cost $c_B$ for good *B*. An important assumption throughout is that consumer surplus is positive in market *A* at the monopoly price. For example, this rules out the possibility that firm 1 extracts the entire consumer surplus with a two-part tariff.

To establish terminology, a price pair $(P_A, P_B)$ is a bundled rebate if it is available to consumers only on the condition that they buy everything from firm 1. Firm 1 also sets a standalone price for A, which a consumer pays if he or she buys $B$ from a competitor. The price $P_A$ in the bundle is discounted from the standalone price. We imagine an initial situation in which firm 1 prices independently across markets, setting prices at $\left(P_A^*, c_B\right)$. Subsequently, firm 1 markets a bundled rebate plan, consisting of bundled prices and a standalone price for $A$. This paper studies the effects of this pricing innovation. We assume that firm 1 can remain committed to its pricing plan even after the consumer has chosen between the rebate plan and the standalone prices.

We consider, in turn, independent pricing by the monopolist and a loyalty program that consists of a standalone price $P_A$ and a price pair $(P_A - e_A, P_B)$. A consumer that participates in the loyalty program receives an $e_A$ discount on all its purchases of $A$ whenever it agrees to make all of its $B$ purchases (at price $P_B = c_B + d_B$) from firm 1. Faced with these alternatives, the consumer decides whether or not to participate in the bundled rebate program and makes purchases accordingly.

*A. Pareto-Improving Bundled Rebates*

One theme of this paper is that bundled rebates, with or without a share-based loyalty feature, can improve or harm welfare. To see how an increase in welfare can result, suppose that initially there is independent pricing, firm 1 charges $P_A^*$ for $A$ and $c_B$ for $B$. Firm 1 can construct another pair of prices consisting of a slightly discounted price of $A$

and a price of $B$ slightly above $c_B$. We can write this price pair as $\left(P_A^* - e_A, P_B\right)$. For $d_B = P_B - c_B > 0$, but sufficiently small, consumers prefer this pair to the independent prices $\left(P_A^*, c_B\right)$. Furthermore, since the effect of $e_A$ on profits is second-order, but that of $d_B$ is first-order, firm 1's profit increases. If firm 1 makes $\left(P_A^* - e_A, P_B\right)$ available only to consumers who buy entirely from firm 1, then $\left(P_A^* - e_A, P_B\right)$ is a bundled rebate. Note that because the customer prefers the bundled rebate to the initial (and still available) prices, an equally efficient competitor cannot make sales at the price $c_B$.

We formalize this intuition by considering bundled rebates $(P_A, P_B)$ that maximize profits to firm 1, subject to the constraint that consumer surplus at $(P_A, P_B)$ weakly exceeds consumer surplus at the initial independent prices $\left(P_A^*, c_B\right)$. Formally, the monopolist's objective is to

$$\underset{\{P_A, P_B\}}{\text{Maximize}} \; p_A(P_A) + p_B(P_B) \tag{2}$$

$$\text{s.t. } CS_A(P_A) + CS_B(P_B) \geq CS_A\left(P_A^*\right) + CS_B(c_B)$$

Without loss of generality, we assume that if the incentive compatibility restraint is met with equality, the consumer selects the bundled rebates.

Theorem 1: Pareto Improvement. Letting $(P_A, P_B)$ denote the optimal prices, the solution to (2) has the following features:

(1) $CS_A(P_A)+CS_B(P_B)=CS_A(P_A^*)+CS_B(c_B)$.

(2) $p_A(P_A)+p_B(P_B)>p_A(P_A^*)+p_B(c_B)$.

(3) Total welfare at $(P_A, P_B)$ exceeds total welfare at $(P_A^*, c_B)$.

(4) $c_i < P_i < P_i^*$, $i = A, B$.

(5) Equally efficient competitors are foreclosed in market *B*.

Proof. See Appendix.

This theorem has three implications for enforcement. First, it shows that the effect of bundled rebates for antitrust analysis is not akin to predation. Not only do $P_A$ and $P_B$ exceed marginal cost, but there is no short run profit sacrifice, as called for by *Brooke Group*. Nevertheless, equally efficient competitors are foreclosed: the lost discount on *A* exceeds the benefit received from obtaining *B* at price $c_B$ instead of $P_B$. Second, although foreclosure is often discussed as if it implies an anti-competitive outcome, this need not be true for bundled rebates. Third, bundled rebates are hard to distinguish from tie-in sales. The independently-set prices $(P_A^*, c_B)$ induce consumers to select the bundled prices and buy everything from firm 1.

## *B. Monopoly Extension Using Bundled Rebates*

We now consider how bundled rebates can extend monopoly from *A* to *B*. Firm 1 sets a standalone price for *A*, $P_A$, a discount $e_A$, and also sets a price $P_B$ for *B*. The prices $(P_A - e_A, P_B)$ are only available if the consumer buys everything from firm 1. Otherwise, the consumer pays $P_A$ to buy $A$ from firm 1 and buys $B$ from a competitor at the price $c_B$. Firm 1's objective is to

$$\underset{\{P_A,P_B,e_A\}}{\text{Maximize}}\ \pi_A(P_A - e_A) + \pi_B(P_B) \tag{3}$$

$$\text{s.t. } CS_A(P_A - e_A) + CS_B(P_B) \geq CS_A(P_A) + CS_B(c_B)$$

Notice that standalone price $P_A$ can be set arbitrarily high provided that $e_A$ increases in a similar fashion. As $P_A \to \hat{P}_A$, $CS_A(P_A) \to 0$ and the incentive compatibility constraint in this problem converges to that of a straight requirements tying problem.

If $CS_A(P_A^*) + CS_B(P_B^*) \geq CS_B(c_B)$ then the constraint above is slack at the optimum. The bundled rebate is $(P_A^*, P_B^*)$ and $P_A$ $(= P_A^* + e_A)$ can be set as follows

$$P_A = \inf\{P \mid CS_A(P_A^*) + CS_B(P_B^*) - CS_B(c_B) \geq CS_A(P)\} \tag{4}$$

If $CS_A(P_A^*) + CS_B(P_B^*) < CS_B(c_B)$ then the constraint binds at the optimum and $P_A$ and $P_B$ are set below their monopoly levels. In equilibrium, $P_A = \hat{P}_A$ in order to relax the incentive constraint as much as possible. With this, the problem is akin to a requirements tying problem but monopoly extension is not complete. The following theorem summarizes this discussion.

Theorem 2: Monopoly Extension. Consider the loyalty discount $(P_A, P_A - e_A, P_B)$.

(i) If $CS_A(P_A^*) + CS_B(P_B^*) \geq CS_B(c_B)$, then $P_A - e_A = P_A^*$, $P_B = P_B^*$, and

$$P_A \geq \inf\left\{P_A \middle| CS_A(P_A^*) + CS_B(P_B^*) - CS_B(c_B) \geq CS_A(P_A)\right\}.$$

(ii) If $CS_A(P_A^*) + CS_B(P_B^*) < CS_B(c_B)$, then $P_A - e_A < P_A^*$, $c_B < P_B < P_B^*$, and

$$P_A = \hat{P}_A.$$

Notice that equally efficient competitors are foreclosed again, and employing a bundled rebate reduces consumer welfare. In Theorem 2.i, total surplus declines because the bundled rebate generates a deadweight loss in B and no change in $A$.

Note that in Theorem 2.ii, where $CS_A(P_A^*) + CS_B(P_B^*) < CS_B(c_B)$, the profit maximizing price of $A$, $P_A - e_A$, is below the initial monopoly price, $P_A^*$. One might conjecture that consumer welfare increases because the effective price for $A$ has fallen. For Theorem 2.ii, however, the optimal prices constrain consumer welfare to equal $CS_B(c_B)$. In contrast, consumer welfare equals $CS_B(c_B) + CS_A(P_A^*)$ > $CS_B(c_B)$ under independent pricing. Hence, using a bundled rebate reduces consumer welfare, even though the discounted price of A is lower.

The total surplus effect of bundled discounts, however, is ambiguous. Compared to the independent prices $(P_A^*, c_B)$, in Theorem 2.ii the bundled price of $A$ is lower and that of $B$ is higher. Hence, total surplus can rise or fall depending on the relative demand in the two markets. The following corollary gives more precision for the case of linear demand in both markets.

<u>Corollary 1.</u> Suppose demands and costs are linear in both markets.

(i) Theorem 2.i corresponds to the inequality: $CS_A(c_A) \geq 3CS_B(c_B)$.

(ii) If $\frac{16}{9}CS_B(c_B) \leq CS_A(c_A) < 3CS_B(c_B)$, then Theorem 2.ii applies and bundled discounts lower total surplus.

(iii) If $CS_A(c_A) < \frac{16}{9}CS_B(c_B)$, then Theorem 2.ii applies and bundled discounts increase total surplus.

<u>Proof:</u> See Appendix.

The reader will note that the one monopoly rent theorem does not hold in this setting. If it did, there could not be any gain to bundled rebates; firm 1 could extract equivalent surplus through the price of $A$. In its most basic form, the one monopoly rent theorem says that any post-bundle increase in $P_B$ would have to be exactly compensated for by a fall in the bundled price of $A$. In this circumstance, bundled rebates would make no sense. For this to be true, there need to be marginal consumers of $A$, not just marginal units purchased. In the present setup, consumer surplus in $A$ is positive at the monopoly price, so that the consumer is never marginal. Only units of demand are marginal. A small increase in $P_B$ raises profits from that market without reducing profits from $A$ at all. In effect, tying $A$ and $B$ through bundled rebates allows firm 1 to leverage its market power in market $A$ to extract more surplus than linear prices would allow it to extract from market $A$ alone.[10]

One might object that firm 1 can fully extract consumer surplus using two-part tariffs, so that the one monopoly rent critique applies. One response to this objection it to assume that the consumer's demand curve has a stochastic element, so that even the optimal two-part tariff does not extract all expected surplus from market A.[11] Under this interpretation, $Q_A(P_A)$ can be thought of as an expected demand curve and $CS_A(P_A)$ as expected consumer surplus.

In the sense that bundled discounts are similar to tying, Theorem 2 invites comparison to Whinston's classic paper.[12] Like the Chicago literature from which he departs, Whinston assumes that consumers have unit demands in both the tying and tied markets, and enjoy zero consumer surplus in the tying market. He then shows that economies of scale for rival firms in the tied market can lead to profitable exclusion in which consumer surplus falls. In Theorem 2, consumers have downward-sloping demand curves in both markets and enjoy positive surplus at the monopoly price in market A. This allows firms to engage in profitable full line forcing, as in Burstein (1960).[13] The other difference between our model and Whinston's is that we assume constant returns, rather than increasing returns, in the tied market.

[10] We are indebted to Eric Emch for this explanation.
[11] See Mathewson, F. and Winter, R. (1997). "Tying as a Response to Demand Uncertainty," *RAND Journal of Economics*, 28(3), 566-583. The same point is also made by Brown, S. and Sibley, D. (1986). *The Theory of Public Utility Pricing*, Cambridge University Press, Appendix to Chapter 4.
[12] Whinston, M.D. (1990). "Tying, Foreclosure and Exclusion," *American Economic Review*, 80(4), 837–859.
[13] Burstein, M.L. (1960). "The Economics of Tie-in Sales," *Review of Economics and Statistics*, 42, 68–73.

Given these differences, Theorem 2 states an alternative theory of profitable monopoly extension via tying in which consumer welfare falls. For a similar discussion of monopoly extension when monopoly pricing does not extract all profit from the markets separately, see Mathewson and Winter (1997).[14] In particular, Mathewson and Winter discuss why tying may increase profits when demand is stochastic so that even the optimal two part tariff does not extract all surplus from market A.

The purpose of Theorems 1 and 2 is to provide a means of distinguishing bundled rebate plans that lower consumer welfare from those that do not. For example, one could compare the effective price of the monopoly good in the bundle to its price under a pre-existing independent pricing regime. If there is no difference, then the bundled rebate plan cannot be Pareto-improving, since Pareto-improving discount plans involve at least a small reduction in the price of the monopoly good (Theorem 1). Such a pattern of no price change for $A$ would be consistent with Theorem 2.i. If the price of $A$ in the bundle is lower than the pre-existing independent price, this is consistent with both Theorem 1 and Theorem 2.ii. To distinguish between them, compare the standalone prices. Under Pareto Domination, the standalone price is simply the pre-existing monopoly price, whereas under Theorem 2.ii the standalone price is higher. The only cases left to consider involve the standalone price being less than $P_A^*$, which is never optimal for firm 1. Thus, we have

[14]Mathewson, F. and Winter, R. (1997). *op. cit*.

covered all relevant cases.[15] Naturally, applying these tests requires price data for well-defined periods preceding and following the introduction of bundled rebates.

## III. Existing Tests of Bundled Rebates

As argued above, bundled rebates are not equivalent to predation, so the case law involving *Brooke Group* is unlikely to be useful in antitrust enforcement. Rather, bundled rebates are best viewed as a form of tie-in sale, in which there are undiscounted standalone prices available as well as a bundle of discounted prices. That said, the case law on tying does not provide convenient rule of reason tests for the competitive effects of bundled rebates.

One test described above is the *Ortho* test. In our terminology, the *Ortho* test would ask whether firm 1's revenues from *B* less the discounts on *A* cover its costs of *B*. If so, then the bundled rebates plan is presumed legal.[16] One problem with this test is that it assumes disequilibrium behavior. That is, if it is passed, why has not a market *B* competitor already undercut the bundle?

It is certainly possible that competitors have higher costs than firm 1, so that they cannot undercut in market *B*. This implies a different underlying model than the present one.

[15] It would be tempting to apply this test to *LePage's*. Unfortunately, the prices required are not available in the public record.

[16] This test is equivalent to determining whether pricing for A and B under the bundled rebate is "compensatory" as introduced by Janusz A. Ordover and Robert D. Willig, "An Economic Definition of Predation: Pricing and Product Innovation," 91 YALE LAW JOURNAL 8 (1981). Ordover served as an economic expert for the plaintiff in *Ortho*. See also Nalebuff (2004c).

Also, if rivals have higher costs, it is not clear that antitrust attention is warranted. Thus, if the *Ortho* test is passed by firm 1, but rivals in market *B* cannot undercut firm 1's price in market *B*, their lack of success may not be due to firm 1's pricing, but to their own failure to match firm 1's costs.

A second point against the *Ortho* test is that a set of bundled discounts can fail it, but still raise consumer welfare.[17] Consider again the intuition behind Theorem 1. Firm 1 can discount off a bundle consisting of a price of *A* slightly below $P_A^*$ and keep the price of *B* at marginal cost. To a first order, profits have not fallen for firm 1 and the consumer is strictly better off purchasing products at $\left(P_A^* - e_A, c_B\right)$ rather than at the original prices $\left(P_A^*, c_B\right)$. Thus, total welfare and consumer welfare have risen. However, even for $e_A$ extremely small, a perfect competitor in *B* cannot "pay" the consumer $e_A$ and still earn a non-negative profit. For these two reasons, the *Ortho* test is of limited usefulness. On the other hand, the price-based test described above will correctly conclude that the bundled discount in this example raises consumer welfare.

The *VAA/BA* incremental test also merits discussion. Share-based discounts can exist within a bundle of prices or can apply to an unbundled single product. Parsing the term "bundled rebates," it appears that it is the bundling of discounted prices that has importance for competition, not whether the discounted prices within the bundle are share-based. To see this, suppose that there is no market *A* and that firm 1 has signed one of its market *B* customers, who consumes 100 units, to a sales contract with the following

[17] In this respect, the *Ortho* test once again resembles cost tests for predation.

features: (1) if the customer buys all 100 units from firm 1, the price is $5 per unit; (2) if the customer buys less than 95 of the 100 units from firm 1, the price is $6 per unit. Suppose that all suppliers in market *B*, including firm 1, have marginal costs of $4. For an equally efficient competitor to sell 5 units to the customer, it need only charge slightly less than $5. However, if it sells 6 units to that customer, then the customer must pay an additional $93 to firm 1, making the marginal revenue of the sixth unit sold to the customer negative. This loyalty discount plan would fail the *VAA/BA* test. However, if the equally efficient competitors can each serve that customer's entire needs of 100 units, all they need to do is make an offer for all 100 units at a price slightly less than $5. Indeed, the equilibrium price should be $4, making the exact form of the discount structure irrelevant.

Unless firm 1's competitors cannot work around the share-based switching costs by bidding for all of a customer's business, share-based discounts are innocuous in our framework. The fact that discounted prices are only available as a bundle is what may generate anticompetitive effects. Hence, the usefulness of the *VAA/BA* incremental test in the context of bundled rebates appears limited.[18] By contrast, the price comparisons described above involve equilibrium prices and can distinguish bundled rebates that raise consumer welfare from those that lower it. Neither the *Ortho* test nor the *VAA/BA* test can do this, even in principle.

[18] However, in a single differentiated product setting in which one firm's product is on average preferred by consumers, loyalty discounts can have anticompetitive effects and the VAA/BA incremental test can distinguish short run profit maximizing behavior from potentially exclusionary behavior. See Greenlee and Reitman (2004).

## IV. A Generalized Test for Consumer Welfare Changes

Our discussion has assumed independent demands for A and B. This facilitates characterizing the optimal bundled and standalone prices. For the more limited (but still important) purpose of determining whether a newly introduced bundled discount strategy raises or lowers consumer surplus, we do not need this assumption.

Suppose that the introduction of a bundled discount causes no change in the price of B. If the standalone price of A, $\hat{P}_A$, is no higher than the pre-bundled monopoly price, then the outside options available to consumers are no worse than before the introduction of the bundled rebate. Clearly, this requires no special assumptions about whether A and B are complements, substitutes, or are independent.

Suppose, alternatively, that the standalone price of A rises with the introduction of the bundled rebate. Assuming that bundling does not change the equilibrium price of B, this implies that the outside options available to consumers are less desirable than the initial prices $P_A^*$ and $c_B$. The bundle prices that maximize firm 1's profits make the consumer indifferent between the bundle rebate prices $(P_A, P_B)$ and the standalone prices $(\hat{P}_A, c_B)$. Hence, if $\hat{P}_A > P_A^*$, then introducing the bundled rebate reduces consumer surplus. Thus, assuming that firm 1 maximizes profits, we have a bright line test to determine whether bundled loyalty discounts raise or lower welfare: if $\hat{P}_A \leq P_A^*$, consumer surplus weakly increases, and if $\hat{P}_A > P_A^*$, consumer surplus diminishes.

As a practical matter, one should sound a cautionary note about the second part of the test. To infer consumer harm from observing $\hat{P}_A > P_A^*$ requires that firm 1 comes close to actually maximizing profits. If the firm fails to maximize profits, it could be true that $P_A < P_A^*$ and $P_B = c_B$, but $\hat{P}_A > P_A^*$. Clearly, the consumer benefits, but since $\hat{P}_A > P_A^*$, our proposed test would suggest otherwise. Hence, before using $\hat{P}_A > P_A^*$ to infer anything, the analyst should try to verify that the bundling firm is maximizing profits. This qualification does not affect the positive inference to be made when $\hat{P}_A \leq P_A^*$.

## V. *SmithKline* Reconsidered

An example of how our test can be applied is provided by *SmithKline Corporation v. Eli Lilly and Company*.[19] Lilly was the sole U.S. supplier of the cephalosporin family of antibiotics, introducing it in 1964 under the brand name Keflin. Subsequently, Lilly introduced three other cephalosporins, under the brand names Keflex, Loridine and Kafocin. Lilly had U.S. patents and exclusive rights for each of these drugs, and was the sole U.S. supplier of cephalosporins until October 1973. At that time, SmithKline entered the cephalosporin market with a drug called Ancef, obtained from a U.S. patent owner under a non-exclusive license. About a month later, Lilly introduced Kefzol, an antibiotic generically equivalent (and thus a direct competitor) to Ancef.

Prior to entry by SmithKline, Lilly had offered volume-related rebates, as part of a Cephalosporin Savings Plan (CSP). In the latter half of 1974, Lilly examined ways to

[19] 427 F. Supp. 1089; 1976 U.S. Dist. LEXIS 12486j 1976-2 Trade Cas. (CCH), P61, 199. Nalebuff (2004c) also discusses *SmithKline* from the standpoint of the *Ortho* test.

combat SmithKline, and on April 1, 1975, it introduced a Revised CSP that reduced the discount to hospitals by about 3%. At the same time, the new pricing plan gave an additional 3% rebate on a hospital's total cephalosporin purchases provided the hospital bought certain minimum quantities, specific to each hospital, for any three of Lilly's five cephalosporin drugs.[20] [21]

From this discussion, the main elements of *SmithKline* roughly coincide with the assumptions of our model. Lilly had monopoly cephalosporin products in the Revised CSP bundle and offered a discount on the bundle. The Court calculated return on sales for Ancef assuming that SmithKline matched Lilly's bundled rebates. Assuming that SmithKline produced Ancef as efficiently as Lilly made Kefzol, the Court found that SmithKline could not match Lilly's bundled rebates without incurring losses.[22] That is, an equally efficient competitor of Kefzol (or Ancef) could not have been profitable against the Revised CSP. The Court found that Lilly had willfully maintained monopoly power under Section 2 of the Sherman Act, but found that Lilly's pricing practices did not constitute tying, under Section 1. Thus, the Court used the Ortho test as a "bright line" test to determine whether or not Lilly's rebates were anticompetitive.

Based on our analysis, the Court came to the correct decision. Because the 3% loyalty discount on Lilly's bundle was cancelled out by the roughly 3% reduction in volume-

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[20] See *Opinion*, in *Smith Kline*, *ibid* Findings of Fact, paragraph 90. SmithKline argued that the total effect of the revised CSP was that "Hospitals allegedly receive approximately the same aggregate rebate under the revised CSP as that paid under the CSP." See *Opinion*, p. 27.

[21] Pharmaceutical companies still employ strategic bundling of drugs with varying degrees of market power. See, for example, Scott Hensley, "Scaled Up: Biggest Drug Firm Faces Generics But Has an Edge: Its Very Bigness," THE WALL STREET JOURNAL, August 23, 2004, A1.

[22] See *Opinion*, paragraph 110.

related rebates, a customer that bought the same quantity of the Lilly monopoly products under the Revised CSP as under the original CSP would have paid the same price either way. In our terminology, letting $A$ refer to Lilly's monopoly goods, $P_A^* = P_A - e_A$, where $P_A^*$ is the monopoly price prior to the Revised CSP. In other words, the standalone prices of Lilly's monopoly goods rose under the Revised CSP and the discounted price with the loyalty rebates was approximately the same as under the original CSP. This puts the Revised CSP into Theorem 2.i, so we conclude that the Lilly pricing strategy reduced total welfare as well as consumer welfare. The Revised CSP would have the desired effect of lowering SmithKline's sales of Ancef and preserving profits on Lilly's cephalosporins even if the price for Kefzol were somewhat above that for Ancef.[23]

Even though the decision in *SmithKline* was correct, our analysis suggests that the reasoning was flawed. When the *SmithKline* court based its conclusion on the negative margin calculation for an equally efficient supplier of Kefzol (or Ancef), it employed the *Ortho* test, which we discussed above. The Court correctly concluded that the Revised CSP foreclosed SmithKline. However, if consumer welfare is the appropriate standard in antitrust enforcement, a finding of foreclosure for an equally efficient competitor is irrelevant. If *SmithKline's* Revised CSP had *not* raised the standalone prices of its monopoly cephalosporin products, consumer welfare would not have fallen (from

[23] As the Court noted, "So long as its price on Kefzol was equal to or not much higher than Smith-Kline's, Lilly counted on its reputation with physicians (particularly surgeons) and the reluctance of hospitals to suffer a decline in rebates (as compared with the rebates previously received under the CSP) because of their failure to participate in the Revised CSP, as a strategy to achieve its domination (goal of 75%) of the cefazolin market." *Opinion*, paragraph 101.

Theorem 1), yet an equally efficient competitor would also have been foreclosed. Thus, the *SmithKline* reasoning can easily lead to incorrect results.[24]

## VI. Conclusion

One main point of this paper is that bundled rebates are best analyzed as tie-in sales and not as a form of predatory pricing. Not only do all prices typically exceed marginal cost, but anticompetitive effects do not require a short term profit sacrifice. Bundled rebates can generate anticompetitive effects, but they do so by confronting consumers with the choice between a collection of tied discount prices and unattractive standalone prices. Bundled rebates raise rivals' costs in market *B* because an equally efficient competitor in market B must compensate consumers for lost discounts in A, in addition to covering its own costs.

However, bundled rebates can also be efficient forms of third degree price discrimination. For this reason, even though equally efficient competitors are foreclosed, aggregate consumer surplus and total surplus can be higher with bundled rebates than with independent pricing, at least in the short run. Another way of looking at this is to say that bundled rebates, like tying, allow firm 1 to extract more consumer surplus than it can extract otherwise from market *A* with ordinary linear prices.

[24] The Third Circuit Court, which affirmed the lower court decision on appeal, came closer to the standard advocated here. The decisive factor in that opinion was that more competition, and with it lower prices, would have prevailed but for the bundled rebate scheme. 575 F. 2nd 1056 (3d Cir 1978.)

This brings us to the second main issue in this paper: are there tests that distinguish "good" bundled rebates from bad? Although the *Ortho* and *VAA/BA* tests have their uses, the discussion above suggests that their value from an enforcement standpoint may be limited. Given the simple model above, though, there may be useful tests based on a comparison of prices before and after the institution of bundled rebates. They depend on there being a distinct date at which bundled discounts are introduced. For example, given our underlying model, if the bundle price of the monopoly good is equal to the initial (monopoly) price under independent pricing, then bundled rebates reduce consumer and total surplus. If the bundle price of *A* falls and the standalone price equals the pre-bundle monopoly price, then total welfare has increased and consumer welfare has not fallen. If the firm maximizes profits and the standalone price of A exceeds the initial price of A, then we can infer that the bundled rebate reduces consumer welfare. While the model structure in the present paper is simple, the clear-cut nature of some of the results suggest that it is worthwhile to see how they may extend to more complex environments.

One final issue concerns the generality of these results. The analysis assumes either that all consumers are identical or that the bundled rebates are designed separately for each customer. For this reason, there is no issue of second-degree price discrimination, which is of great importance in the tying literature. Is this an important loss of generality? On the whole, we think that it is not. This is because loyalty discounts frequently are tailored to each customer's usage. In *LePage's*, for instance, 3M's bundled discounts were separate agreements between 3M and individual retailers. Therefore, the avoidance of issues of second-degree price discrimination seems appropriate.

The present analysis assumes that firm 1 sells to final consumers, or to firms that do not impose competitive externalities on one another (*e.g.* local monopolists, or firms in a perfectly competitive industry). A useful extension of our results would be to examine consumers that are oligopolists. In such a setting, offering bundled loyalty discounts would be a type of exclusive dealing. Intuition suggests that counterparts to Theorems 1[25] and 2 hold, but this remains to be proven.

[25] Viewing $P_A$ and $P_B$ as input prices to a downstream industry earning positive profits, a small reduction of $P_A$ below $P_A^*$ has a first order effect on downstream demand from Shephard's Lemma. The effect on firm 1's profits is second order, so Pareto-improving bundled discounts likely exist in this broad context.

**Appendix**

*Proof of Pareto Improvement Theorem*

$$\text{Let } \Pi = Q_B(P_B)\cdot(P_B - c_B) + (P_A - c_A)Q_A(P_A) + l \cdot \left\{ \int_{P_A}^{P_A^*} Q_A(s)ds - \int_{c_B}^{P_B} Q_B(s)ds \right\}$$

Where $P_A^*$ solves $Q_A(P_A) + (P_A - c_A)Q'(P_A) = 0$.

Theorem 1. Maximizing $\Pi$ w.r.t. $P_A$, $P_B$, and $l$, at the optimum, $P_A < P_A^*$, $P_B > c_B$.

(1) $CS_A(P_A) + CS_B(P_B) = CS_A(P_A^*) + CS_B(c_B)$;

(2) $p_A(P_A) + p_B(P_B) > p_A(P_A^*)$;

(3) Total welfare at $(P_A, P_B)$ exceeds total welfare at $(P_A^*, c_B)$;

(4) $c_i < P_i < P_i^*$, $i = A, B$;

(5) Equally efficient competitors are foreclosed in market *B.*

Proof.

1. The Kuhn-Tucker conditions are

$$\frac{\partial \Pi}{\partial P_A} = Q_A(P_A) + (P_A - c_A)Q'_A(P) - l \cdot Q_A(P_A) = 0 \quad \text{(A1)}$$

$$\frac{\partial \Pi}{\partial P_B} = Q_B(P_B) + (P_B - c_B)Q'_B(P_B) - l \cdot Q_B(P_B) = 0 \quad \text{(A2)}$$

$$l \cdot \left( \frac{\partial \Pi}{\partial l} \right) = 0 \quad \text{(A3)}$$

2. Suppose $l = 0$. Then (A1) and (A2) imply $P_A = P_A^*$ and $P_B = P_B^*$ which in turn implies that $CS_A(P_A) + CS_B(P_B) < CS_A(P_A^*) + CS_B(c_B)$. This, however, violates the constraint, so we conclude that $l > 0$. Together with (A3), this implies (1).

3. From (A1) and (A2), $P_A < P_A^*$ and $P_B < P_B^*$. Then (1) implies $c_B < P_B$, which from (A2) means that $l < 1$. Thus, from (A1), $c_A < P_A$. This proves (4).

4. Since $\left(P_A^*, c_B\right)$ are feasible, step 3 implies (2).

5. From (1) and (2) we have (3).

6. Since (1) holds, an equally efficient competitor would have to lower prices below $c_B$ to attract customers. This proves (5).

*Proof of Corollary 1: Linear Demand*

Let $Q_A\left(P_A\right) = A - aP_A$ and $Q_B\left(P_B\right) = B - bP_B$. Then $CS_A\left(c_A\right) = (A - ac_A)^2/(2a)$, $CS_B\left(c_B\right) = (B - bc_B)^2/(2b)$, $P_A^* = (A + ac_A)/(2a)$, $P_B^* = (B + bc_B)/(2b)$, $CS_A\left(P_A^*\right) = (A - ac_A)^2/(8a)$, and $CS_B\left(P_B^*\right) = (B - bc_B)^2/(8b)$. The condition in Theorem 2 that distinguishes between the two solutions, $CS_A\left(P_A^*\right) + CS_B\left(P_B^*\right) \geq CS_B\left(c_B\right)$, simplifies to $(A - ac_A)^2/(2a) \geq 3(B - bc_B)^2/(2b)$, which can be written as $CS_A\left(c_A\right) \geq 3CS_B\left(c_B\right)$.

When this condition is not satisfied, the optimal $P_A = \hat{P}_A = A/a$ and the constraint in (3) binds. Firm 1's maximization problem is

$$\underset{\{e_A, P_B\}}{\text{Maximize}} \;\; \Pi = e_A\left(A - ae_A - ac_A\right) + \left(P_B - c_B\right)(B - bP_B)$$

$$\text{s.t. } \frac{ae_A{}^2}{2} + \frac{\left(B - bP_B\right)^2}{2b} = \frac{\left(B - bc_B\right)^2}{2b}.$$

It is helpful to make a change of variables before solving. Let $e_B = B/b - P_B$. Then the maximization problem can be written as

$$\underset{\{e_A, e_B\}}{\text{Maximize}} \;\; \Pi = e_A\left(A - ae_A - ac_A\right) + e_B(B - be_B - bc_B)$$

s.t. $\frac{ae_A{}^2}{2}+\frac{be_A{}^2}{2}=\frac{\left(B-bc_B\right)^2}{2b}$.

Letting $l$ be the Lagrange multiplier for the consumer surplus constraint, the first order conditions for $e_A$ and $e_B$ are

$$\frac{\partial \Pi}{\partial e_A}=A-2ae_A-ac_A-l\cdot ae_A=0 \text{ and}$$

$$\frac{\partial \Pi}{\partial e_B}=B-2be_B-bc_B-l\cdot be_B=0,$$

and the optimal solution is

$$e_A=\frac{\left(A-ac_A\right)\left(B-bc_B\right)}{\sqrt{a^2\left(B-bc_B\right)^2+ab\left(A-ac_A\right)^2}} \text{ and } e_B=\frac{a\left(B-bc_B\right)^2}{b\sqrt{a^2\left(B-bc_B\right)^2+ab\left(A-ac_A\right)^2}}.$$

The deadweight loss at the optimal loyalty discount $\left(P_A,P_A-e_A,P_B\right)$ can be written as $(A-ae_A-ac_A)^2/(2a)+(B-be_B-bc_B)^2/(2b)$, while the deadweight loss under independent pricing $\left(P_A^*,c_B\right)$ is $(A-ac_A)^2/(8a)$. Thus total surplus rises after firm 1 implements loyalty pricing whenever

$$\frac{(A-ae_A-ac_A)^2}{2a}+\frac{(B-be_B-bc_B)^2}{2b}<\frac{(A-ac_A)^2}{8a}.$$

Substituting the optimal values for $e_A$ and $e_B$ and simplifying, total surplus rises whenever

$$\frac{(A-ac_A)^2}{16a}<\frac{(B-bc_B)^2}{9b},$$

which can be written as $CS_A\left(c_A\right)<16CS_B\left(c_B\right)/9$.

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