TYING AND BUNDLED DISCOUNTS: AN EQUILIBRIUM ANALYSIS OF ANTITRUST LIABILITY TESTS

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ABSTRACT

Courts have struggled with determining when bundled discounts constitute unlawfully anticompetitive behavior. The current circuit split reflects an absence of consensus. This lack of legal guidance creates uncertainty in the market, with firms being given inconsistent – and sometimes contradictory - standards on how to avoid antitrust liability.

For the most part, we consider a standard paradigm for analyzing bundled discounts. Suppose that there are two firms. Firm 1 produces a monopoly product, A, and also another product, B, which competes with another version of B produced by Firm 2. The concern is the extent to which the price paid for A is linked to the purchase of B from Firm 1: has the bundling resulted in anticompetitive conduct in violation of Section 2 of the Sherman Act?

We analyze three main approaches: the discount attribution test, the Elhauge proposal, and the Profit Sacrifice Test. Each of these has received much recent discussion, but very little of the debate takes into account the effects of bundled discounts where all firms are setting prices that maximize profits, i.e. in equilibrium. With homogeneous goods in the B market, the attribution test should be failed is all firms are maximizing profits. The Elhauge proposal makes sense with equilibrium prices in some types of markets, but not others. The profit sacrifice test turns out to be vacuous when applied to bundled discounts, since in equilibrium there turns out to be no profit sacrifice.

i. We explore related issues with tying arrangements.

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The lack of legal clarity regarding bundled discounts matters because legal uncertainty creates its own cost; firms may be reluctant to provide bundled discount plans that benefit their customers and increase profits, and, conversely, anticompetitive behavior harming consumers may escape regulation.

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I. INTRODUCTION

The process of bundling goods – that is, grouping goods together for purchase at an apparent discount – has attracted much scrutiny by courts, administrative agencies and scholars who have attempted to determine when bundling results in anticompetitive behavior, harming consumer welfare. The main antitrust problem arises when the bundling links the price consumers pay in a monopoly market to their use of the monopolist’s services in a distinct competitive market. While a myriad of state and federal legislation regulates competition, we focus on the standards for determining when bundling constitutes unlawful competition under Section 2 of the Sherman Act.

Currently, there is a circuit split, with the Third Circuit using the LePage’s exclusionary effects test\(^1\) while the Ninth\(^2\) and Sixth\(^3\) Circuits use the discount attribution test. The U.S. Supreme Court denied the petition for certiorari in LePage’s v. 3M,\(^4\) possibly in part because the U.S. Department of Justice and the Federal Trade Commission urged the court to wait until the economic and legal scholarship was more developed.\(^5\) While courts have struggled with how to manage the antitrust questions arising from the practice of bundling, economics scholarship has developed various tests to determine when bundling reduces consumer welfare. And while courts have relied on these tests, economists themselves have grappled with creating reliable analyses of a

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1 LePage’s Inc. v. 3M, 324 F. 3d 141 (3d Cir. 2003).
2 Cascade Health Solutions v. PeaceHealth, 515 F.3d 883, 906 (9th Cir. 2007).
3 Collins Inkjet Corp. v. Eastman Kodak Co, 781 F.3d 264 (6th Cir. 2015).
practice that sometimes raises consumer welfare, sometimes reduces it, and, as discussed infra, sometimes increases the welfare of some consumers while reducing that of others.6

Three of these tests – the discount attribution test, the profit sacrifice test, and the Elhauge proposal – are leading approaches. In all three tests, however, the previous economic analysis has been based on hypothetical examples, with no discussion of what would actually happen if the firms operated in equilibrium, meaning that each firm sets its price(s) so as to maximize its profit, given the prices chosen by rivals.7 More realistic and useful – and what this paper attempts – is an analysis of how these three models would operate when applied to equilibrium prices, that is, in circumstances closer to market conditions. An economic analysis shows that the Elhauge proposal works in some circumstances, particularly when there is perfect competition in the B market. However, this proposal can penalize bundled discounts that actually raise consumer welfare in other circumstances. When applied to equilibrium prices, the profit sacrifice test is vacuous when applied to bundled discounts, since bundled discounts do not involve a profit sacrifice. In addition to looking at the outcomes of these tests, it will often be useful for courts to examine additional background factors, such as (1) whether Firm 2 would have been viable absent the bundled discounts, and (2) whether the bundled discount plan would involve an exit (or deterred entry) by Firm 2.

In Part II of this paper, we provide an overview of the law and examine the role of consumer welfare in determining whether antitrust violations have occurred. In Part III,

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6 See infra pp. 40-42.

7 In equilibrium the market is at a “point at which supply of a good and demand for it are perfectly balanced and will not change unless the market is disturbed” Herbert Hovenkamp, Economics and Federal Antitrust Law 3-4 (1985).
we provide economic analyses of three existing models: the discount attribution test, the profit sacrifice test and the Elhauge proposal. In Part IV, we draw conclusions and make recommendations. The appendix contains a summary of relevant economic results on tying and bundled discounts.

II. ANTITRUST LAW AND BUNDLING

A. THE PROBLEM: BUNDLING AND ITS EFFECT ON CONSUMER WELFARE

Bundling is an effective sales strategy. It involves selling a collection of products typically for a price less than the consumer would pay if purchasing the items separately. Bundling differs from tying because purchasing the bundled goods is optional; there is nothing to stop the consumer from purchasing the items separately. When a toothbrush, for example, is sold with toothpaste in a single package, the consumer can choose whether to buy the bundle or whether instead to separately purchase a toothbrush or toothpaste.

8 Collins Inkjet Corp. v. Eastman Kodak Co. 781 F.3d 264, 273 (6th Cir. 2015) (“In a bundled discount, the seller offers two products together (the bundle) at a price lower than the sum of the prices of the two products sold separately.”).
Buying tied products, by contrast, leaves the consumer with no choice. If one can buy insulin, for example, only with the injection needles, then the two products have been tied. Tying can constitute an antitrust violation if the “defendant has market power in the tying product.” Predatory pricing occurs when a seller prices its product below its average variable cost. Predatory pricing is presumably designed to undercut competitors and force them out of the market, after which time the predator can raise its prices to a supra-competitive level, i.e. a level higher than would exist if the competitor(s) had not been forced from the market. Because this conduct has the effect of reducing consumer welfare, it constitutes a violation of the Section 2 of the Sherman Act.

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9 A tying arrangement exists when the “the seller's exploitation of its control over the tying product to force the buyer into the purchase of a tied product that the buyer either did not want at all, or might have preferred to purchase elsewhere on different terms.” Jefferson Par. Hosp. Dist. No. 2 v. Hyde, 466 U.S. 2, 12 (1984) (tying involving complements: hospital services and anesthesiology services), abrogated by Ill. Tool Works Inc. v. Indep. Ink, Inc., 547 U.S. 28, 41-42 (2006).

10 Richard A. Posner, Vertical Restraints and Antitrust Policy, 72 U. CHI. L. REV. 229, 234 (2005) (“in tying, the buyer is forced to buy the tied product as a condition of obtaining the tying product”).


12 Cascade Health Solutions v. PeaceHealth, 515 F.3d 883, 909-10 (9th Cir. 2007).

13 See, e.g., Matsushita Elec. Indus. Co. v. Zenith Radio Corp., 475 U.S. 574, 588 (1986) (“Any agreement to price below the competitive level requires conspirators to forgo profits that free competition would offer them. The forgone profits may be considered an investment in the future.”).

Bundling presents some of the same problems as tying. While bundling can create advantages for both buyers and sellers, there is a risk that sellers can reduce competition in the B market in violation of Section 2 of the Sherman Act. Bundling is attractive for sellers because it allows them to sell a greater quantity of products, to sell a greater variety of products, to gain economies of scale, to increase the value of its brand, to reduce churn (by increasing switching costs), and to reduce transaction costs. Successful bundling increases consumption of some goods beyond what would

15 Jeffrey A. Jaeckel, LePage’s, Cascade Health Solutions, and a Bundle of Confusion: What is a Discounter to Do? 24 ANTITRUST ABA 46, 46 (2010) (noting that as “a matter of theory, the literature concludes that bundled discounts are often precompetitive or competitively neutral”).

16 Cascade Health Solutions v. PeaceHealth, 515 F.3d 883, 897 (9th Cir. 2007).

17 Jessica Darveau & Alain Astous, Bundle Building in the Arts: An Experimental Investigation, 31 PSYCHOL. & MARKETING 591 (2014) (finding that creating arts and culture activity bundles through a subtractive fashion yielded greater consumption than creating bundles as additives, possibly due to loss aversion); Andrea Mantovani, The Strategic Effect of Bundling: A New Perspective, 42 REV. OF INDUS. ORG. 25 (2013) (bundling may allow increases in price).


19 PHILLIP E. AREEDA & HERBERT HOVENKAMP, ANTITRUST LAW: AN ANALYSIS OF ANTITRUST PRINCIPLES AND THEIR APPLICATION 343 (3d ed. 2008) (“Bundling serves a number of pro-competitive or competitively benign purposes, including achievement of scale or scope economies, quality control, and many instances of price discrimination”).


22 David S. Evans & Michael Salinger, Why Do Firms Bundle and Tie? 22 YALE J. ON REG. 37, 41 (2005). See also Timothy J. Muris & Vernon L. Smith, Antitrust and Bundled Discounts: An Experimental Analysis, 75 ANTITRUST L.J. 399, 404 (2008) (noting that studies show that bundling can increase the “efficiency of their distribution systems by allowing them to reduce agency and information costs, thereby lowering both
occur if the products were sold separately. In one sense, almost all goods are bundled because they could presumably be broken down to component units to be sold.

Bundling is attractive to buyers because they can choose to get more goods for often reduced costs. Bundling is an attractive way to market at various business levels – from the largest cell phone carriers to the smallest taco truck, businesses can gain market share by bundling their goods. Bundling can therefore increase total welfare; i.e. both buyers and sellers can gain from the practice. It should not, therefore, be considered a *per se* violation of antitrust laws.

However bundling can become predatory when bundles are priced so as to reduce competition. The classic circumstance (and the fact pattern common to most reported bundled discount cases) is when a seller has a monopoly on a product (for example, transactions costs of marketing and consumer’s search costs by selling preferred packages of goods” (citation omitted)).

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26 Cascade Health Solutions v. PeaceHealth, 502 F.3d 895, 905 (9th Cir. 2007) (“The world’s largest corporations offer bundled discounts as their product lines expand with the convergence of industries… a street corner vendor with a Ford car – a merchant with limited capital – might offer a discount to a customer who buys a drink and potato chips to complement a hot dog.”).


28 Cascade Health Solutions v. PeaceHealth, 502 F.3d 895, 896 (9th Cir. 2007).

29 See, e.g., LePage’s Inc. v. 3M, 324 F.3d 141 (3d Cir. 2003) (3M had a monopoly on branded cellophane tape but competed on bundled items); Cascade Health Solutions v. PeaceHealth, 515 F.3d 883 (2007) (PeaceHealth had a monopoly on tertiary hospital services in the region but competed on primary and secondary acute care services); and
because they hold a patent) and pairs it with a second non-monopoly product in a bundle. If the stand-alone price of the monopoly “A” product is inflated, critics charge, then the non-monopoly “B” product (when bundled with the A product) will give the false appearance of being a bargain,\(^\text{30}\) all to the harm of competitors of the B product. The price of A, in other words, can be manipulated so that the B product appears to be cheaper.\(^\text{31}\) If a competitor of the second, non-monopoly product is forced from the market by the bundle, has there been an antitrust violation?\(^\text{32}\) Or, even if there is no harm to a competitor, could such pricing reduce consumer welfare?

**B. CIRCUIT SPLIT: **LEPAGE’S AND CASCADE HEALTH

The first appellate case to fully explore the anticompetitive effects of bundling was *LePage’s Inc. v. 3M*.\(^\text{33}\) Defendant 3M, the manufacturer of Scotch transparent tape, offered a discount when retailers’ purchases of 3M products (including transparent tape

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31 “[B]undling,” some have noted, “can be a profitable method to separate consumers into two groups, those who really want A alone and those who do not. This separation can allow the firm to use bundled pricing to extract additional value from consumers and thereby increase the firm’s profits,” Dennis W. Carlton & Michael Waldman, *Safe Harbors for Quantity Discounts and Bundling*, 15 Geo. Mason L. Rev. 1231, 1236 (2008).


33 324 F.3d 141 (3d Cir. 2003).
or any other 3M products) exceeded certain levels. LePage’s was a competitor in the transparent tape market, but did not have 3M’s wide diversity of product offerings; therefore LePage’s had a reduced ability to provide bundles of different products.

The parties agreed that 3M was a more efficient producer of transparent tape than was LePage’s.34 There was no showing that the bundled rebate constituted a profit sacrifice on 3M’s part.35 Similarly, there was no showing that 3M engaged in predatory pricing,36 i.e. pricing below its cost. Despite that, the jury concluded that 3M’s conduct amounted to maintenance of a monopoly in violation of Section 2 of the Sherman Act37 and awarded more than $68M, before adding interest.38 On appeal, the Third Circuit upheld the jury verdict, finding that the bundled rebate program was an attempt to maintain monopoly power in the market for transparent tape and that LePage’s relatively few products made it difficult for them to compete.39 As a result, a firm’s bundling programs could be unlawful, the court held, even if the conduct reduced prices for consumers (and thus increasing consumer welfare) and an equally efficient producer would apparently be able to match the prices.

34 Id. at 177 (Greenberg dissenting) (“LePage's economist conceded that LePage's is not as efficient a tape producer as 3M”).
35 Id. at 151.
36 Id. at 151.
37 Id. at 145.
38 Id. at 145.
39 Id. at 155 (“The principal anticompetitive effect of bundled rebates as offered by 3M is that when offered by a monopolist they may foreclose portions of the market to a potential competitor who does not manufacture an equally diverse group of products and who therefore cannot make a comparable offer.”).
The LePage’s decision has been widely criticized\(^{40}\) in part because its use of the test did not evaluate whether a bundled discount was pro-competitive.\(^{41}\) Instead, it simply declared that it was unlawfully anticompetitive if a monopolist offered bundles with a broader product line than did competitors.\(^{42}\) The decision raised a debate over the standards used to determine monopolization because exclusion resulting from bundled discounts resembles both price predation (because the manufacturing is cutting prices for the bundle) and exclusionary conduct (in that it could result in foreclosing rivals in a manner similar to tying).\(^{43}\) Despite the widespread comment and criticism, the U.S. Supreme Court denied 3M’s petition for certiorari in the matter.\(^{44}\) Notably, the U.S. Department of Justice and the Federal Trade Commission argued against granting certiorari, urging the court to wait until the case law and economics scholarship were

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\(^{42}\) Antitrust Modernization Comm’n, Report and Recommendations 97 (2007).


\(^{44}\) LePage’s Inc. v. 3M, 542 U.S. 953 (2004).
more developed. A subsequent Third Circuit case declined to extend the LePage’s test to cases other than bundling.

The next case to examine the anticompetitive effects of bundling was Cascade Health v. PeaceHealth. In Cascade Health, the plaintiff and defendant were the only two providers of hospital care in Lane County, Oregon. PeaceHealth had a monopoly over tertiary health care services, but competed with Cascade Health in providing primary and secondary services. At issue was PeaceHealth’s package of primary, secondary and tertiary health care services with which Cascade Health could not compete. At trial, the court instructed the jury to use the LePage’s exclusionary effects test, i.e. that if a bundled discount offered by a monopolist included a more diverse product line than a competitor was able to offer, it was anti-competitive. On appeal, the Ninth Circuit reversed. Using a discount attribution test, the court allocated the bundle’s

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Although the business community and consumers would benefit from clear, objective guidance on the application of Section 2 to bundled rebates, this case does not present an attractive vehicle for this Court to attempt to provide such guidance. . . . While bundled rebates may be a common business practice, it is not clear that monopolists commonly bundle rebates for products over which they have monopolies with products over which they do not. The United States submits that, at this juncture, it would be preferable to allow the case law and economic analysis to develop further and to await a case with a record better adapted to development of an appropriate standard.


47 515 F.3d 883 (9th Cir. 2007).

48 Id. at 891.

49 Id. at 892.

50 Id. at 909.
discount to the competitive product. If this competitive product was resultanty priced below the bundler’s cost, the court observed, it was anticompetitive, noting that this “ensures that the only bundled discounts condemned as exclusionary are those that would exclude an equally efficient producer of the competitive product or products.”

Whether the Ninth Circuit would continue to follow the discount attribution test was put in question by *Meijer, Inc. v. Abbott Laboratories,* which held that the goal of the *Cascade Health* rule (making unlawful only combinations that would exclude only equally efficient competitors from the market) would not be furthered in the case at bar because average variable cost (used to determine whether a product is priced at a level below profit) was meaningless in the pharmaceutical industry, where research and development costs “dwarf” variable costs. Also critical was the district court in *Aerotec International, Inc. v. Honeywell International, Inc.* where, citing the facts of the case, the court noted that the high proportion of separate, unbundled sales prevented a finding of coercion.

However, an affirmation of *Cascade Health’s* use of the discount attribution test came more recently in *Collins Inkjet Corp. v. Eastman Kodak Co.* decision from the

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51 *Id.* at 909.
52 544 F.Supp.2d 995 (N.D. Calif.).
53 *Id.* at 1003.
55 The *Aerotec* court observed that in *Cascade Health,* only 14% of customers made separate purchases while, in *Aerotec,* at least 45% of the sales were separate. In fact, the decision noted, the percentage was so high that “the court actually presumes that Honeywell was not engaged in tying” *id.* at 1134. The court appears to use the terms tying and bundling interchangeably, noting that the plaintiff alleged illegal tying (*id.* at 1132) but then engaging in a bundling analysis (*id.* at 1134).
56 781 F.3d 264 (6th Cir. 2015).
Sixth Circuit. In a tying case, the court noted that the Ninth Circuit’s *Cascade Health* analysis was more compelling than the Third Circuit’s *LePage’s* analysis, finding that the discount attribution standard appropriate for “ties enforced purely through differential pricing.”

Clearly, then, courts are struggling for a consensus on the tests to be used in determining when bundled discounts are anticompetitive, with the Third Circuit’s *LePage’s* exclusionary effects test and the Ninth Circuit’s discount attribution test. Additional contenders include the Antitrust Modernization Commission’s recommendation; the *Ortho* standard (based on a district court decision from the Second Circuit that deemed a bundled discount exclusionary if a competitor was an equally efficient producer of a competitive product but the defendant’s bundling rendered the

57 *Id.* at 273.

58 *Id.* at 274.


60 The Antitrust Modernization Commission (“AMC”) recommended that “[c]ourts should adopt a three-part test to determine whether bundled discounts or rebates violate Section 2 of the Sherman Act. To prove a violation of Section 2, a plaintiff should be required to show each one of the following elements (as well as other elements of a Section 2 claim): (1) after allocating all discounts and rebates attributable to the entire bundle of products to the competitive product, the defendant sold the competitive product below its incremental cost for the competitive product; (2) the defendant is likely to recoup these short-term losses; and (3) the bundled discount or rebate program has had or is likely to have an adverse effect on competition.”. The *Cascade* court adopted the discount attribution test portion of the test but declined to adopt the remainder of the AMC’s proposed test. ANTITRUST MODERNIZATION COMM’N 99 (2007), *available at* http://govinfo.library.unt.edu/amc/report_recommendation/amc_final_report.pdf. Antitrust Modernization Commission.
plaintiff unable to continue to operate profitably),\textsuperscript{61} and an extension of the \textit{Brooke Group}\textsuperscript{62} predatory pricing test, a proposal that would treat a bundle as a single product and apply a predatory pricing test to the price and cost of the bundle.\textsuperscript{63} The lack of consensus on the standards required of this very common commercial practice makes business a more precarious undertaking;\textsuperscript{64} a condition that harms both businesses and consumers.

C. \textsc{The Consumer Welfare Standard}

Antitrust laws, it has been noted, protect competition, not competitors.\textsuperscript{65} What interests are the antitrust laws intended to protect? It is unclear what the framers’ intent was when the Sherman Act\textsuperscript{66} was created in 1890. A general welfare test would require a balancing of gains against losses\textsuperscript{67} and a decision reached accordingly. By contrast, the

\begin{itemize}
\item \textsuperscript{61}Ortho Diagnostic Sys., Inc. v. Abbott Lab., Inc. 920 F.Supp. 455 (S.D.N.Y. 1996) holding that a claimant alleging a § 2 claim based on anticompetitive bundling must “prove either that (a) the monopolist has priced below its average variable cost or (b) the plaintiff is at least as efficient a producer of the competitive product as the defendant, but that the defendant’s pricing makes it unprofitable for the plaintiff to continue to produce”.
\item \textsuperscript{63}Jeffrey A. Jaeckel, \textit{LePage’s, Cascade Health Solutions, and a Bundle of Confusion: What is a Discounter to Do?} 24 \textsc{Antitrust ABA} 46, 48 (2010) (noting that 3M advocated the use of this test in \textit{LePage’s}).
\item \textsuperscript{64}Jeffrey A. Jaeckel, \textit{LePage’s, Cascade Health Solutions, and a Bundle of Confusion: What is a Discounter to Do?} 24 \textsc{Antitrust ABA} 46, 46 (2010). \textit{See also} Richard M. Steuer, \textit{Bundling Beyond Borders}, 24 \textsc{Antitrust ABA} 40, 44 (2010) (noting that the “law on bundled discounts is a moving target in every jurisdiction”).
\item \textsuperscript{65}Bathke v. Casey’s Gen. Stores, 64 F.3d 340, 344 (8th Cir. 1995).
\item \textsuperscript{67}Herbert Hovenkamp, \textit{Implementing Antitrust’s Welfare Goals}, 81 \textsc{Fordham L. Rev.} 2471, 2473 (2013).
\end{itemize}
late Professor Bork asserted that antitrust law should adopt a consumer welfare standard to determine illegality, but equated this with a general welfare standard. 68 Much has been written about the distinction, with one commentator noting that the original intent behind the Sherman Act was to protect small businesses from larger competitors. 69 The U.S. Supreme Court cases indicate that consumer welfare is the controlling standard. 70 The answer matters because it changes the underlying analysis. There are examples of bundling that affect general welfare and examples that affect consumer welfare. Even deciding to analyze the economic effects of the various standards using a consumer welfare standard, however, is difficult because some consumers benefit while others lose in particular examples of bundling or tying. 71

Legal treatments of tying and bundling tend to oversimplify when it comes to consumer effects. First, it is usually assumed that all, or nearly all, consumers are affected in the same way by the conduct at issue. Second, it is implicitly assumed that only consumers who buy under a particular tying or bundling arrangement are affected by it. However, when looking at the equilibrium effects of these practices, neither assumption is correct. 72


69 For a robust discussion, see Herbert Hovenkamp, Implementing Antitrust’s Welfare Goals, 81 FORDHAM L. REV. 2471, 2472 et seq. (2013).


72 See infra Appendix.
A brief example helps illustrate the point: consider a model with two firms, as outlined above. Firm 1 produces a monopoly product, (“A”), and a product (“B”) that faces competition from Firm 2. The two firms make differentiated versions of B, and some consumers prefer one to the other. Therefore, consumers do not make buying decisions based only on prices, but also on which brands they prefer. Some customers buy both A and B (“A-and-B” customers) and some buy only B (“B-only” customers). Under independent pricing, Firm 1 sets the monopoly price for A and both firms price their versions of B above marginal cost.

Now suppose that Firm 1 switches from independent pricing to bundled discounts. This means that it offers a discount on A below the previous monopoly price to any consumer who also buys all of his or her needs of B from Firm 1. Where Firm 1 makes money on bundled customers is that the bundle price of B is elevated above where it would be under independent pricing. Some A-and-B customers prefer Firm 2’s version of B strongly enough that they are not attracted to the bundle. Therefore, Firm 1 sets an out-of-bundle price of A that is more attractive to an A-and-B customer who prefers Firm 2 for B, than the bundle. This out-of-bundle price is higher than the pre-bundling monopoly price of A.

How does Firm 2 react to all this? Its main strategic goal is to keep as many customers as possible out of Firm 1’s bundle. Therefore, in the new bundling equilibrium Firm 2 cuts its price. This helps it to retain at least some A-and-B customers, who will have to buy A at the out-of-bundle price, and pulls some B-only customers away from

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73 This model is laid out *infra* Appendix.
Firm 1. Even in this relatively simple setup, different customers are affected in different ways.

- A-and-B customers whose B preference is strongly towards Firm 1 are better off under bundled discounts than under independent pricing due to the bundle discount on A.

- Some A-and-B customers whose B preference is towards Firm 2, select the bundle to avoid paying the high out-of-bundle price for A, but are worse off than in the independent pricing equilibrium.

- Some A-and-B customers prefer Firm 2 so strongly that they are willing to buy A at the high out-of-bundled price in order to get B from Firm 2. They are worse off under bundled discounts.

- B-only customers who prefer Firm 1 are worse off, because Firm 1 elevates its price of B in the bundling equilibrium.

- B-only customers who prefer Firm 2 are better off than they were under independent pricing, because Firm 2 lowers its B price to compete with the bundle.

We analyze, infra,\textsuperscript{74} examples where aggregate consumer welfare is slightly higher under bundling than under independent pricing. However, each of the above five types of outcomes exist in each of those examples, and the “losers” in each case be quite a large fraction of the total body of consumers. Consequently, it is inaccurate to talk about bundled discounts “helping consumers” as if all consumers are better off than

\textsuperscript{74} See infra Technical Appendix.
under independent pricing. Furthermore, to reach conclusions regarding the consumer welfare effects of bundling, the analysis must include the fact that even the B-only customers are affected, some negatively and some positively.

To take account of consumer welfare effects this complicated and in such diverse settings may be hard to do in practice. This seems to imply that applying a pure consumer welfare standard may be very difficult, once equilibrium effects of tying are taken into account.

Does this mean that the effort is always hopeless? Hardly. Suppose that the B market is perfectly competitive, so that consumers view each seller’s version of B as not different from the version sold by another seller. In this case, the above complications do not arise and a consumer welfare standard can be implemented with confidence. This is the case analyzed by Elhauge, discussed further infra. The same conclusion follows even when the B market is not perfectly competitive as long as the equilibrium price of B is relatively unaffected by Firm 1’s decision to bundle.

III. EQUILIBRIUM ANALYSIS OF THESE APPROACHES

Because the relevant decisions are few and conflicting and because these decisions rest so heavily on the validity of the economic analyses employed, a rigorous review of three dominant economic approaches is useful. We discuss the discount attribution test, the profit sacrifice test, and the Elhauge proposal. For a comprehensive

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75 For a comparative law discussion of bundling, see Richard M. Steuer, Bundling Beyond Borders, 24 ANTITRUST ABA 40 (2010).
analysis of relevant economic results on tying and bundled discounts, we refer the reader to the appendix.

A. **THE DISCOUNT ATTRIBUTION TEST**

The best-accepted approach to analyzing bundled discounts is the discount attribution test employed in *Cascade Health*. The discount attribution test applies the full discount to the competitive ("B") product in the bundle. If, after the discount is applied, the price of the competitive product is below the seller’s cost, the test has failed and the conduct may be unlawfully exclusionary. This assumes that all firms have the same marginal cost of B and that it is well approximated by average variable cost (AVC). Denoting Firm 1’s B price by $P_1$, the discount attribution test is passed if:

$$P_1 - \frac{\text{discounts from A}}{\text{unit sales from B}} \geq c_B$$

If a bundled discount plan passes the discount attribution test, this is interpreted to mean that a hypothetical equally efficient competitor, producing the same B product as Firm 1, could profitably undercut the bundle at a price at or above marginal cost. If Firm 1’s prices pass this test, then the plaintiff bears the burden of showing why it cannot compete with Firm 1’s prices.

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76 *Cascade Health v. PeaceHealth*, 515 F.3d 883, 906 (9th Cir. 2007).
77 *Id.*
78 *Id.*
Implementation issues with the attribution test have been summarized clearly and comprehensively by Professor Economides.\textsuperscript{79} Our focus is conceptual. To begin, consider the well-known example of shampoo and hair conditioner, from the decision in \textit{Ortho Diagnostic Systems, Inc. v. Abbot Laboratories, Inc.}\textsuperscript{80} Firm 1 sells both shampoo and hair conditioner and Firm 2 only sells shampoo. If a consumer buys shampoo and conditioner from Firm 1 separately, he or she pays $4 for the conditioner and $3 for the shampoo. Assume that both firms have a marginal cost of $1 for shampoo and $2 for conditioner and that shampoo sold by one firm is identical to shampoo sold by the other firm. If the consumer buys both products from Firm 1 as a bundle, the prices are $3 for conditioner and $2.25 for shampoo. Under the discount attribution test the bundle discount on conditioner, $1, is subtracted from Firm 1’s price of shampoo, $2.25. The result, $1.25, exceeds Firm 1’s marginal cost of shampoo, $1. Therefore, Firm 1’s bundled discount plan passes the discount attribution test.

However, there is a problem with this conclusion, because these numbers also imply that Firm 2 can undercut the bundle profitably. For example, it can charge $1.10 for shampoo, giving it a unit profit of $.10. At this price, a consumer can afford to buy shampoo from Firm 2, to pay the undiscounted price of $4 for conditioner and still pays less for a bottle of each product ($5.10) than the $5.25 the Firm 1 charges for the bundle. Firm 1 makes no sales of shampoo. Its total profit is limited to the $2 that it makes on a unit of conditioner. These prices cannot possibly be part of an equilibrium, which

\textsuperscript{79} See Nicholas Economides, \textit{Tying, Bundling and Loyalty/Requirements Rebates}, in \textit{RESEARCH HANDBOOK ON THE ECONOMICS OF ANTITRUST LAW} 121 (Einer Elhauge ed., 2012).

\textsuperscript{80} 920 F.Supp. 455 (S.D.N.Y. 1996).
requires that each firm choose its prices so as to maximize its profit, given the prices set by the other firm. To see why, suppose that Firm 1 raises the out-of-bundle price of conditioner from $4 to $5. The apparent discount on conditioner when buying the bundle is now $2 and the discount attribution test is failed, because $2.25 - $2.00 = $.25 < $1.00, the marginal cost of shampoo to both firms. Firm 2 sells nothing, because it cannot charge more than $.25 for shampoo, which is below its marginal cost of $1. Firm 1 now sells both conditioner and shampoo to each consumer at the bundle price of $5.25, and its profit has gone from $2.00 to $2.25 (= $5.25 - $2 - $1). By deviating from the initial prices in the example, Firm 1 can raise its profit above the initial $2.00, given Firm 2’s price. Hence, the hypothesized initial prices in the example cannot be equilibrium prices because they do not maximize profits for Firm 1. In equilibrium, the bundled discount must fail the attribution test.

The problem raised by this example is general if (1) one seller of B makes a monopoly product; (2) all sellers in the B market make a single homogeneous product; and (3) if consumers care only about price. If the discount attribution test is passed, this implies that the entire bundled discount plan can be undercut profitably by any single product seller of B. To avoid this, Firm 1 need only raise the out-of-bundle price of A to the point where this does not occur. However, at that point, the discount attribution test is failed. Because hair conditioner is assumed to be a monopoly, presumably protected by entry barriers, the equilibrium in this type of example is one where Firm 2 is foreclosed.

However, even if the discount attribution test is passed, there can still be foreclosure. To see why, suppose that the versions of B sold by the two are differentiated
from each other, so that some consumers have preferences over one or the other, whereas other consumers may have only mild preferences. In this setting, each firm can raise its price above the other’s price without losing all of its customers. Therefore, each firm will typically price above marginal cost. Suppose that Firm 1’s price of B with discounts is far enough above its marginal cost that its bundled discount plan passes the attribution test. Does this mean that there are no competitive problems? Not necessarily. Assume that Firm 2’s fixed costs are low enough so that Firm 2 is viable when Firm 1 prices independently but too high for it to be viable when Firm 1 uses a bundled discount plan\(^{81}\). That is, faced with bundled discounts by Firm 1, Firm 2 may be able to price high enough so that it covers variable costs, but still fail to cover fixed costs. Since Firm 1’s bundled discount plan passes the attribution test, one might suppose that Firm 2 can profitably undercut Firm 1’s bundled discount plan. However, in equilibrium, Firm 2 is already pricing so as to maximize profits, given the bundled discount plan of Firm 1. If it is not covering total costs (fixed plus variable) at its profit-maximizing price, it necessarily does even worse if it prices below Firm 1’s price of B (adjusted for lost discounts on A). Hence, there is no “fix” for Firm 2 that makes it solvent, even though the attribution test is passed.\(^{82}\)

This does not mean that the discount attribution test is not useful. It is very useful. However, sometimes its results must be used along with other facts to reach a correct conclusion. Suppose that a given bundled discount plan fails the discount attribution test. This may well mean that as things stand, Firm 2 cannot compete against

\(^{81}\) *See infra* for a numerical example.

\(^{82}\) To analyze Firm 2’s viability, the spirit of *PeaceHealth* suggests using Firm 1’s fixed costs attributable to its B product line only.
the plan, even if it is equally efficient. Does this mean that the plan reduces competition? Not necessarily. Suppose that Firm 2 can produce the A product, but has simply decided not to do so thus far. If it does produce A, it can neutralize Firm 1’s bundled discount plan, and the two firms can compete on bundles. Therefore, to say that a bundled discount plan harms competition, the failure of the discount attribution test must be accompanied by a showing of a barrier to entry into the A market. If the discount attribution test is passed, this does not necessarily mean that the bundled discount plan is benign, however. As we have seen, in a differentiated products equilibrium, bundled discounts by Firm 1 can leave Firm 2 unable to cover fixed costs, even though the test is passed. Depending on circumstances, other types of background information may turn out to be useful.

B. PROFIT SACRIFICE TEST

The profit sacrifice test (hereafter “PST”) is a test of liability that was not specifically developed with tying or bundling in mind. Instead, it was initially developed as a way of detecting predatory pricing. It has come to be a general test for monopolization under Section 2 of the Sherman Act. Melamed has argued that the PST is the best approach to distinguishing lawful from unlawful behavior in a

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84 But see U.S. Dep’t of Justice, Competition and Monopoly: Single-Firm Conduct Under Section 2 of the Sherman Act, ch. 3 (III) (B) (2008), which recommended that a profit sacrifice test not be used to determine Section 2 liability, available at www.usdoj.gov/atr/public/reports/236681.htm. The report was withdrawn May 11, 2009.

monopolization case.\textsuperscript{86} He defines the PST as asking whether or not the conduct at issue would be profitable in the short run for the defendant if it did not exclude business rivals, thereby preserving or increasing market power for the defendant.\textsuperscript{87} If the conduct would not be profitable absent a reduction in competition, then the inference is that it must have been intended to exclude rivals who would otherwise remain viable, constituting anticompetitive conduct.\textsuperscript{88} Cabral and Riordan equate predation with profit sacrifice.\textsuperscript{89} They call “an action predatory if (1) a different action would increase the probability that the rivals remain viable, and (2) the different action would be more profitable under the counterfactual hypothesis that the rival’s viability went unaffected.”\textsuperscript{90} As noted above, the PST makes no assumptions about the relative costs of a dominant firm and its rivals. It is not concerned with price increases that are not brought about by a reduction in the degree of competition facing the dominant firm.

\textit{1. Applying the PST to Tying}

Whether tying passes the PST depends on the structure of the B market. Suppose that the B market is perfectly competitive, and that A is a monopoly of Firm 1. Initially, it prices both products independently, A at the monopoly price and B at marginal cost, as do the other sellers of B. Some consumers buy both A and B, while

\textsuperscript{86} \textit{Id.} at 1255.

\textsuperscript{87} \textit{Id.}

\textsuperscript{88} Melamed notes that conduct that fails the profit sacrifice test would be anticompetitive (for antitrust law purposes) but not necessarily unlawful, in that additional proof would be required to show that the anticompetitive conduct allowed the defendant to gain or maintain market power that it would not otherwise have. \textit{Id.} at 1255, note 20.


\textsuperscript{90} \textit{Id.} at 160.
others buy only B. Then suppose that Firm 1 institutes a requirements tie. It tells customers who buy both products that they must buy B at an inflated price in order to be allowed to buy any A at all. Given a choice between buying B at a premium and getting some benefit from consuming A, and getting B at marginal cost, but doing without A altogether, customers choose the tying arrangement. Customers who buy only B just switch to other firms. Firm 1’s profit goes up by doing this, and the B market remains as perfectly competitive as it was before.\footnote{Patrick Greenlee, David Reitman & David S. Sibley, \textit{An Antitrust Analysis of Bundled Loyalty Discounts}, 26 INT’L J. INDUS. ORG. 1132, 1135, 1137-38.} Under these assumptions, the tying arrangement passes the PST. There is no profit sacrifice.

However, now assume that the B market is a duopoly with differentiated B products. Whinston\footnote{Michael D. Whinston, \textit{Tying, Foreclosure, and Exclusion}, 80 AM. ECON. REV. 837 (1990).} analyzes tying in a model\footnote{The analysis is no different using a requirements tie, as demonstrated above. We phrase things using Whinston’s model in this section because its multistage structure is familiar to most economists.} that can be applied to deterring entry or to inducing exit by an incumbent Firm 2. Whinston begins by showing that if both firms are active, Firm 1’s profit is less than or equal to its profit if it priced independently. The model has three stages:

- **Stage 1:** Firm 1 either pre-commits to tying or it does not.
- **Stage 2:** Both firms decide simultaneously to enter or not to enter.
- **Stage 3:** If both firms are active in the B market, they choose prices simultaneously. If not, the active firm sets the monopoly price.
As noted, Whinston’s model assumes that the B market is a differentiated duopoly. Further, he assumes that all B customers also consume A under independent pricing. Consumers buy at most one unit of either product and in the initial version of the model, all consumers having the same valuation for one unit of the monopoly A product. Tying in this framework means a package tie: selling A and B in a single package containing one unit of each product. Whinston assumes that Firm 1 can credibly pre-commit to tie if it chooses. This is necessary because Whinston shows that if Firm 1 ties in this manner, and both firms are active, then both firms’ Firm 2’s equilibrium profit levels are no higher than if Firm 1 had priced A and B independently. Absent such a pre-commitment, Firm 2 will assume that Firm 1 will price independently and will not be excluded. Given that, Firm 1 does better by refraining from tying, and pricing independently. However, if Firm 1 can credibly bind itself (i.e., pre-commit) to tying no matter what, then Firm 2 will exit/not enter if its fixed costs are excessive. Firm 1 will be a B monopolist of the package.

From these points, it is clear that when Firm 1 pre-commits to a tie, there is a cost to doing so. If Firm 2 is active and Firm 1 ties, its profit is no higher than if it had priced independently. Even if Firm 2 is not active, Firm 1’s monopoly status is a limited one, because it is only a monopolist of a bundle. If enough B customers dislike Firm 1’s version of B, it may need to steeply discount the tied price of A in order to get them to buy the bundle. Hence, it is possible that Firm 1 as a bundle monopolist may be less profitable than it would under independent pricing against an active Firm 2.

With this in mind, if Firm 1 pre-commits to tying, this only increases Firm 1’s profit if the precommitment excludes Firm 2. Otherwise, Firm 1 does better with
independent pricing. Therefore, there are two possible equilibrium outcomes in the Whinston model, depending on the magnitude of Firm 2’s fixed costs. First, if Firm 2’s fixed costs are low enough that it can make a positive profit against tying, then in Stage 1 Firm 1 knows this, does not pre-commit to tie, and there is no exclusion. In Stage 2, both enter and there is independent pricing in Stage 3. However, if Firm 2’s fixed costs are high enough to make it non-viable in Stage 3 given tying by Firm 1, then the resulting equilibrium is that Firm 1 pre-commits to tying in Stage 1, deterring entry (or inducing exit) by Firm 2 in Stage 2 and in Stage 3 becomes a bundle monopolist.

On the equilibrium path where Firm 1 ties, it fails the PST. Assuming that both firms were active in Stage 3, tying is less profitable for Firm 1 than independent pricing. Hence, the success of tying in deterring entry (inducing exit) by Firm 2 involves a profit sacrifice in the but-for world in which Firm 2 is active in Stage 3.

2. Applying the PST to Bundled Discounts

As shown above, bundled discount pricing is at least as profitable for Firm 1 as is independent pricing. For this reason, to the extent that a given bundled discount plan lowers Firm 2’s profit to the point that it becomes negative, this does not involve a profit sacrifice by Firm 1. If one were to formally model an entry-pricing game (as Whinston did) there would be no need for an initial pre-commitment stage; Firm 1 will always find bundled discounts to be superior to independent pricing. Instead, the relevant stages are Stage 2 and Stage 3. In Stage 3, with both firms active, there is a bundled discount equilibrium. Therefore, working back to Stage 2, Firm 1 definitely enters and Firm 2 enters if and only if its profits in such an equilibrium allows it to cover its fixed costs.
Clearly, bundled discounts can exclude competition, because Firm 2’s gross profits may be lowered to the point where they do not cover fixed costs. However, there is no profit sacrifice involved for Firm 1, so the PST is useless. We note in passing that if the PST were applied to markets in which the B market is perfectly competitive, or nearly so, the same would be true. Thus, in contrast to tying, with bundled discounts the PST cannot pick up the potential for competitive harm.

C. **ELHAUGE PROPOSAL**

Because of the problems with existing models in analyzing the effects of bundled discounts, analysts have proposed new models. One of the most discussed recently is that of Professor Elhauge, who put forward a novel proposal for dealing with bundled discounts.\(^9^4\) First, he argues that the case law on tying implies a consumer welfare standard and that tying claims *per se* violate this standard unless A and B are used in fixed proportions.\(^9^5\) Second, he asserts that if a bundled discount plan has the feature that \(P_A\) exceeds the but-for price of A, then it should be treated as a *per se* illegal tie. Otherwise, Professor Elhauge maintains, it should be presumed legal.

The basis for Elhauge’s analysis is an observation made by Greenlee, Reitman and Sibley \(^9^6\) (hereafter “GRS”). GRS note that if the B market is perfectly competitive, then the price of B from any seller other that Firm 1 is unchanged by Firm 1 adopting a


\(^{95}\) If A and B are used in fixed proportions, then the One Monopoly Rent Theorem applies, and the tying arrangement is presumably benign.

bundled pricing plan: price will always equal marginal cost at any other seller of B. Therefore, if Firm 1 adopts a bundled discount plan in which the out-of-bundle price of A is no higher than the pre-bundling monopoly price of A, no consumer can possibly be worse off due to the bundling. On the other hand, if the out-of-bundle price of A is above the pre-bundling monopoly price of A, all A-and-B customers must be worse off. B-only customers can always buy B from a rival at marginal cost, so they are unaffected. Comparing the out-of-bundle price of A to the previous monopoly price of A has come to be known as the GRS test.

GRS also show that if the B market is perfectly competitive, then if the out-of-bundle price of A, \( P_A \), exceeds the but-for price of A, its only purpose is to move A-and-B consumers into the bundled discount prices.\(^{97}\) GRS point out that in this setting the bundled discount plan is equivalent to a tying arrangement.\(^{98}\) Thus, if the B market is perfectly competitive, Elhauge’s proposal correctly implements his view that antitrust law implies a consumer welfare standard.\(^{99}\) If the GRS test is passed, all consumers are better off. If it is failed, all consumers are worse off.

However, the clean results of Professor Elhauge’s proposed test do not hold true if the B market is a differentiated duopoly. GRS show that in such a model, equilibrium bundled discount prices can have the following features:\(^{100}\)


\(^{99}\) Elhauge’s policy would also work if the B market were an oligopoly with at least two firms other than Firm 1, and where consumers all go to the firm with the lowest price.

\(^{100}\) See infra Technical Appendix.
In all the simulations performed by GRS, equilibrium profits under bundled discounts are higher than under independent pricing.\(^{101}\)

The out-of-bundle price of A is higher than the but-for price in equilibrium, so that it would fail the Elhauge test. Yet aggregate consumer welfare can be higher under bundled discounts than with independent pricing.

These economic results cut against applying Elhauge’s proposed rule on bundled discounts if the B market is well described by the differentiated duopoly model. First, in the differentiated duopoly model, there is no gain to tying arrangements for Firm 1 if both firms are active in the B market. However, bundled discounts are always profitable compared to independent pricing. Therefore, to treat bundled discounts as if they were ties may make no sense in such cases. Second, even when the out-of-bundle price exceeds the previous monopoly price, substantial numbers of consumers may well be better off than under independent pricing. Third, aggregate consumer welfare can be higher with bundled discounts than without them, even if the out-of-bundle price of A fails Elhauge’s test.

More fundamentally, with heterogeneous B customers picking different prices, it is not clear that a consumer welfare standard is even workable. For such a standard to work, it should be true that all, or nearly all, consumers are affected in the same direction by tying or bundled discounts. That is, they are nearly all better off or nearly all worse off. From our discussion on tying, bundled discounts and independent pricing,\(^ {102}\) this condition is not met for the differentiated duopoly case.

\(^{102}\) See infra Appendix.
These difficulties with a consumer welfare standard do not arise, of course, if one interprets Section 2 as meaning that the focus of analysis is whether or not a tying arrangement or bundled discount plan reduces competition. We now proceed to discuss the issues that arise in this more traditional interpretation of Section 2.

D. Application of Specific Intent Test

As noted above, bundled discount cases typically concern markets that are reasonably well described by the differentiated duopoly model. Among the claims often made by plaintiffs in such cases is attempted monopolization, prohibited under Section 2 of the Sherman Act. The legal standard for attempted monopolization requires a showing “(1) that the defendant has engaged in predatory or anticompetitive conduct with (2) a specific intent to monopolize and (3) a dangerous probability of achieving monopoly power”. Assuming that there is no documentary evidence of specific intent, it can only be inferred from the actual bundled discount prices and their effects on Firm 2’s viability. Specifically, were the actual prices involved in the plan ($P_A$, $\varepsilon$, and $P_1$) chosen with an eye to inducing Firm 2 to exit? From an economic standpoint, Firm 2 exits if and only if its gross profits in equilibrium do not cover its fixed costs. Thus a finding of specific intent amounts to asking whether equilibrium pricing with bundled discounts is affected by Firm 2’s fixed costs. In the complete information setup of our model, they are not. In equilibrium, both firms price at the point where marginal revenue equals marginal cost, so fixed costs are irrelevant to the price levels set by Firm 1.

Assume that initially Firm 1 prices independently and that Firm 2 is viable in that situation. Then Firm 1 switches to bundled discounts, lowering Firm 2’s profits as a result. Whether Firm 2 exits the market depends on whether its revenues cover both variable and fixed costs. Firm 1 sets the same prices if Firm 2 has no fixed costs at all (and cannot be excluded) as it does if Firm 2’s fixed costs are high enough so that Firm 2 cannot survive.\textsuperscript{104} Therefore, nothing in the equilibrium pricing of Firm 1 is at all illuminating about determining whether there was a specific intent to monopolize.

The outcome is different for tying in the differentiated duopoly model. Firm 1 does worse with tying than with independent pricing, as long as Firm 2 is active in the B market. Therefore, Firm 1 pre-commits to a tie only if Firm 2 is likely to conclude that subsequent competition with Firm 1 will not allow it to cover its fixed costs. Hence, even without documentary evidence of intent, one might reasonably conclude that tying in the Whinston setting implies intent to monopolize.

IV. CONCLUSION AND RECOMMENDATIONS

Courts are split – and economists are divided – on the appropriate tests to use in analyzing when the commercial practice of bundling constitutes unlawfully anticompetitive behavior. This paper differs from that of other economic analyses in that it uses a more realistic model, i.e. by examining how the three most utilized tests operate under equilibrium constraints. In addition, while most discussions of tying and bundled discounts assume that the tied product is homogeneous and that the tied market is

\textsuperscript{104} Michael D. Whinston, Tying, Foreclosure, and Exclusion, 80 AM. ECON. REV. 837 (1990) (making the same observation about tying).
characterized by marginal cost pricing, we have departed from traditional practice by replacing this tied market assumption with the more realistic differentiated duopoly model, allowing for strategic interaction between the duopolists.

As a preliminary matter, economic results on the profitability of tying imply that one should be cautious about applying tying law to analyze bundled discounts. If the tied market is perfectly competitive, or approximately so, then tying is indeed profitable and is equivalent to bundled discounts. Hence, it seems appropriate to apply tying law to bundled discounts, as suggested by Professor Elhauge. However, in the differentiated duopoly case, tying is not profitable, although bundled discounts are profitable. Since the two types of pricing are unlike each other in this case, it is hard to see why one should apply tying law to bundled discounts.

Third, we have shown that the discount attribution test for liability with bundled discounts may require careful interpretation and other relevant information in an equilibrium context. If sellers produce homogeneous products and there are no consumer switching costs, the discount attribution test is always failed in equilibrium. In the differentiated duopoly case, equilibrium prices can either pass or fail the discount attribution test. However, the outcome does not tell us anything about whether Firm 2 is viable competing against bundled discounts.

Fourth, we have shown that the PST correctly recognizes that tying in the duopoly case involves a profit sacrifice and is presumably intended to exclude competitors. However, the PST is vacuous when applied to bundled discounts, since this type of pricing does not involve a profit sacrifice.
Fifth, we have shown that the specific intent test for attempted monopolization is not generally useful for analyzing bundled discounts. Neither the adoption of bundled discounts as a strategy nor the specific prices chosen are influenced by Firm 2’s fixed costs. It is the latter that determine whether Firm 2 exits the market. For tying, however, the opposite is true in the Whinston model. Although the specific levels of the tied prices are not affected by Firm 2’s fixed costs, the decision to use tying in the first place is based entirely on Firm 2’s fixed costs and their likely impact on a decision by Firm 2 to exit. Hence, if the B market follows the differentiated duopoly model used herein, the use of a tie\textsuperscript{105} implies specific intent to monopolize and would support an attempted monopolization claim.

The implications of these results for enforcement depend on one’s interpretation of Section 2 and on the underlying model of competition in the B market. Suppose that the B market is perfectly competitive. Taking the view that the case law dictates a consumer welfare standard, bundled discounts are potentially anticompetitive even though there is no substantial reduction in competition in the B market. Elhauge’s proposed rule would be a suitable enforcement policy under this view. In equilibrium, tying also leads to consumer harm in this case, so it, too, would be found to be a violation of antitrust law under Elhauge’s interpretation of the law, absent any efficiencies.

On the other hand, if the B market obeys the differentiated products duopoly model, matters are less clear cut. Bundled discounts can raise consumer welfare even though the out-of-bundle price of A exceeds the but-for price. Therefore, applying

\textsuperscript{105} Absent the possible efficiencies of tying first described by Ward Bowman in \textit{Tying Arrangements and the Leverage Problem}, 67 \textit{Yale L.J.} 19, 21-23 (1957).
Elhauge’s rule would lead to a perverse result. The discount attribution test would be uninformative, since a bundled discount plan that passes it could also lead to exit by Firm 2.

If neither the discount attribution test nor Elhauge’s proposal is appropriate for the differentiated duopoly model, how should antitrust enforcement proceed in monopolization cases involving bundled discounts? One would simply have to see (1) whether Firm 2 would have been viable absent the bundled discounts; and (2) whether the bundled discount plan at issue involve exit or deterred entry by Firm 2. This type of investigation is usually at the heart of bundled discount litigation as it is.

In sum, the practice of employing economic insight into legal analysis requires a comprehensive and nuanced analysis of how the proposed models operate in conditions more realistically approximating the marketplace. This analysis using equilibrium pricing should prove most helpful in identifying when bundling results in consumer welfare loss or gain and should, with consistent application, provide more helpful guidance to firms trying to avoid antitrust liability.
V. APPENDIX: TYING, BUNDLED DISCOUNTS AND INDEPENDENT PRICING

A. TECHNICAL APPENDIX ON BUNDLED DISCOUNTS AND TYING

At this point, we describe the differentiated duopoly model in more detail. We assume a Hotelling model in the B market. Members of the population of B consumers have varying preferences regarding Firm 1 and Firm 2. Setting aside price effects, some have strong preferences for one firm or the other and some have preferences that do not strongly favor Firm 1 or Firm 2. Given the prices charged by each firm, each B consumer decides where to buy based on his or her own preferences between the two firms and on their relative prices. Even a consumer with a strong preference for Firm 1 will buy at Firm 2 if its price is low enough relative to Firm 1’s B price. In this model, each consumer has a taste parameter denoted by “t”, which reflects his or her preferences between Firm 1 and Firm 2 in the B market. If a consumer has a t value close to zero, he or she strongly prefers Firm 1; a t value close to 1 indicates a preference for Firm 2. A consumer whose taste for B is at, say t = 1/3, prefers Firm 1 to Firm 2, but is not perfectly satisfied with either. For a consumer with t = 1/3, the dollar amount by which a less-than-ideal unit of B reduces the consumer’s welfare is given by k times 1/3 if that consumer buys from Firm 1 and by k times 2/3 if he or she buys from Firm 2. One can think of k as measuring the extent to which he or she is willing to override preferences between the two firms to get a lower price. A high level of k means that a consumer requires a very large price difference in order to buy from his or her less preferred firm. A low value of k means that a consumer’s choice between firms is dictated largely by their relative prices, and not very much by underlying preferences for one firm versus the
other. The values of k used in the simulations below are meant only to illustrate the general qualitative effects of tying and bundling, and are not intended to have any empirical significance.

Another feature of the model is that a fraction, θ, of the consumer population values both A and B. Both the θ A-and-B customers and the 1-θ B-only customers have preferences between Firm 1 and Firm 2 as described above. For further technical details on the model setup, see Section 7 in GRS.

B. SIMULATIONS OF BUNDLED DISCOUNTS V. INDEPENDENT PRICING

GRS present a series of numerical simulations to compare bundled discounts and independent pricing in a differentiated products duopoly. Table 1 reproduces the GRS calculations\(^\text{106}\) for the effects of bundled discounts compared to independent pricing. Consider first independent pricing. The monopoly price of A is 3.9 and the equilibrium price in the B market is 2.29 for each firm; each firm’s marginal cost of B is 2. Each firm sells to half the B market. Firm 1 sells to those whose tastes are located closer to it than to Firm 2; that is, Firm 1 sells to customers located between \(t = 0\) and \(t = \frac{1}{2}\). Firm 2 sells to the other half of the B market (i.e., from \(t = \frac{1}{2}\) to \(t = 1\)).

GRS consider bundled discounts that allow all customers who buy their B from Firm 1 to get a discount on the monopoly good, A. The equilibrium prices for both firms under bundled discounts depend crucially on the share (θ) of A-and-B customers in the total population of B customers. If that share is sixty percent, for example, Table 1 shows that the out-of-bundle price of A is 4.38, whereas the discounted bundled price of

A is only 3.41, considerably lower than the monopoly price of A under independent pricing, 3.9. The B price charged by Firm 1 with bundling rises to 2.35, and is paid by all customers who buy B from Firm 1, whether or not they also buy A. Firm 2 lowers its price for B to 2.24, as compared to 2.29, which was Firm 2’s equilibrium price when Firm 1 priced A and B independently. Firm 2 lowers its price to this level in order to better compete with Firm 1’s bundled discount pricing.

Table 2 shows the equilibrium profits of both firms under independent pricing and bundled discounts. Firm 1’s profits are always higher under bundled discounts than under independent pricing; Firm 2’s prices are lower. Table 3 shows aggregate consumer welfare, averaged over all customers, whether they bought B from Firm 1 or Firm 2. Bundled discounts lead to higher average consumer welfare than independent pricing does.

These simulation results are only special cases of a more general result: in the differentiated duopoly setting, Firm 1 is always better off with bundled discounts than with independent pricing. To see why this is true in general, consider a bundled discount plan, which we can summarize as \((P_A, \varepsilon, P_1)\). \(P_A\) is the out-of-bundle price of A, \(\varepsilon\) is the bundle discount on A and \(P_1\) is Firm 1’s price on the B market; thus, if a consumer buys B only from Firm 1, that consumer only pays \(P_A - \varepsilon\) for A, whereas if the consumer buys any B from Firm 2, he or she must pay \(P_A\). Set \(\varepsilon = 0\), i.e., no bundle discount. With \(\varepsilon = 0\), the price a consumer pays for A is not linked to his or her choice of vendor for B. Hence, \(P_A\) should be set at the independent monopoly level \(P_A^*\). In the B market, prices

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107 Some B-only consumers buy from Firm 1 even though its price of B is higher than Firm 2’s price because their basic preferences heavily favor Firm 1. That is, they have values of \(t\) less than 1/2.
are at the same levels as under independent pricing because consumers’ purchase
decisions for B are de-linked from the price of A with $\varepsilon = 0$. Hence, the bundled discount
plan reproduces the independent pricing equilibrium. If Firm 1 has a nontrivial plan (i.e.,
with $\varepsilon > 0$) we can infer that its profit is higher than under independent pricing.

C. TYING V. INDEPENDENT PRICING

Whinston\textsuperscript{108} has analyzed the effects of tying in a model in which each consumer
buys at most one unit of A or B and in the B market consists of two firms, one of which
(Firm 1) also is an A monopolist. Tying in this setting is a package tie-in, in which the
ty ing firms sells only bundles consisting of one unit of A and one unit of B. Assuming
that the demands for A and B are independent, he shows that if both firms are active in
the B market, then the equilibrium profits for both firms are lower than what they would
earn under independent pricing. Hence, the only incentive for Firm 1 to tie is to possibly
exclude Firm 2 from the market. Since tying is not optimal for Firm 1 if it finds itself
facing an un-excluded Firm 2 competing in the B market, it can only exclude Firm 1 if it
can credibly pre-commit to tying. That is, it must commit to tie even if it were to face an
active Firm 2. If it can do so, then it can convince Firm 2 that it will tie even if to do so
results in a profit sacrifice compared to independent pricing. Firm 2 then contemplates
its prospectively lower profits and exits the B market if it will be unable to cover its fixed
costs under these conditions.

\textsuperscript{108} Our model of tying is basically the same as that of Michael D. Whinston, \textit{Tying,}
\textit{Foreclosure, and Exclusion}, 80 \textit{American Economic Review} 837 (1990). The main
difference is that Whinston studies the tying of unit demands - effectively bundling one
unit of A with one unit of B in a single package - whereas we assume requirements tying.
Whinston’s model includes the Hotelling model as a special case, but is more general.
We have extended Whinston’s analysis (very slightly) to allow for requirements tying, in which consumers can buy multiple units of A and B. Analytical results on the profitability of requirements tying do not exist for the differentiated duopoly model. However, we have performed several dozen simulations, all of which confirm Whinston’s main result: if Firm 1 and Firm 2 are both active, they each earn lower profits than with independent pricing.\textsuperscript{109} Representative results are shown in Figure 1. Hence, absent the ability to pre-commit to a tie, there is no incentive to tie in the independent demands setting.\textsuperscript{110}

D. DISAGGREGATING THE CONSUMER WELFARE EFFECTS OF BUNDLED DISCOUNTS

We have mentioned the fact that in a differentiated duopoly equilibrium, Firm 2 reacts to bundled discounts by lowering its own price. This point is almost always overlooked in legal discussions and is generally overlooked even in purely economic discussions.\textsuperscript{111} It implies that even consumers who do not choose to buy at the bundled prices are indirectly affected by them in equilibrium. In the case where sixty percent of B consumers also value A, 40 percent of B customers do not value A at all and some of that 40 percent prefer Firm 2’s version of B at the equilibrium prices. These consumers pay a


\textsuperscript{110} This assumes that A and B are not complements.

\textsuperscript{111} Cf. John Thanssoulis, *Competitive Mixed Bundling and Consumer Surplus*, 16 J. ECON. & MGMT. STRATEGY 437 (2007). This paper assumes unit demands and two firms who both bundle two products. He finds that if consumers have preferences over firms, as we assume here, then bundling raises profits but reduces consumer welfare, contrary to our simulation results. He also finds changes in pure component prices that affect consumer welfare.
lower price to Firm 2 due to Firm 1’s bundled discounts and are better off than under independent pricing, even though they do not buy from Firm 1 at all. B-only customers who have a strong preference for Firm 1 pay more with bundled discounts (2.35) than under independent pricing (2.29), and are worse off. So are A-and-B customers who opt out of the bundled prices because they have a strong preference for Firm 2 in the B market.

Figure 1 examines the impact of bundled discounts on the subset of consumers who would buy both A and B under independent pricing. It assumes that sixty percent of B customers buy A, or $\theta=0.6$. As a benchmark, the dashed curve shows consumer welfare for different types of A-and-B customers under independent pricing by Firm 1. As we have noted above, with independent pricing all consumers of B pay the same price in equilibrium, 2.29, and those who also value A all buy it at the price 3.9. Notice that consumer surplus (from both A and B) declines up to the consumer type $t = 1/2$, and then rises. This is because consumers to the left of $t = 1/2$ have a relative preference to Firm 1, but as one moves closer to $t = 1/2$, customer preferences become relatively less favorable to Firm 1’s version of B. After that point, consumers with $t > 1/2$ select Firm 2 and as we go closer and closer to the location of Firm 2, we get to A-and-B customers whose tastes in B are closer and closer to the product sold by Firm 2; hence, the dashed line rises from $t = .5$ onward. To be clear, this curve does not represent any B-only consumers, but only those who would buy both A and B under independent pricing by Firm 1.

\[112\] That is, it does not show consumer welfare for those customers who buy no A under independent pricing.
The solid curve in Figure 2 shows the welfare of these consumers when faced with the bundled discount prices. As with the dashed curve for independent pricing, as \( t \) increases from zero, consumer welfare declines because consumers with less and less relative preference for Firm 1 are induced to buy B from it in order to get the bundled discount on A. At roughly \( t = .77 \), the solid curve turns up. The point .77 is the consumer type who is indifferent between buying B from Firm 1 (and getting the bundled discount on A) and buying B from Firm 2, and paying the higher out-of-bundle price for A. For consumer types greater than .77, it is better to buy B from Firm 2 and pay the higher out-of-bundle price for A. Notice that at about \( t = .68 \) the solid curve crosses the dashed curve from above. This means that A-and-B customers whose tastes are located below .68 are better off under the bundled discount arrangement than under independent pricing; so are B-only customers who buy from Firm 2. Other A-and-B customers are worse off, as are B-only customers who buy from Firm 1. The main point of this discussion is that bundled discounts will often benefit some customers, while harming others.

E. The Attribution Test

To calculate the attribution test in this model, we need one further piece of notation. Let \( t_{AB} \) denote the fraction of the \( \theta \) A-and-B customers who buy B in Firm 1’s bundle. Let \( t_{B0} \) be the fraction of the 1-\( \theta \) B-only customers who buy from Firm 1. These terms are presented mathematically in GRS equations (13) and (14). With this additional notation, we can write the attribution test as:

\[
p_1 = \frac{(\varepsilon q_A (P_A - \varepsilon) \theta t_{AB})}{[(1 - \theta) t_{B0} + \theta t_{AB}] q_B (p_1)}
\]

where \( q_A = 24 - 5P_A \), \( q_B = 25 - 4P_B \).
Consider the row for $\theta=0.20$ in Table 1. In that row, the equilibrium prices are:

\[ P_A = 4.55, P_A - \varepsilon = 3.45, P_1 = 2.30, P_2 = 2.27. \]

Using GRS equations (13) and (14), we obtain:

\[ t_{AB} = 0.89242, t_{B0} = 0.45242. \]

We insert these quantities into the above expression and obtain 2.145, which exceeds 2, Firm 2’s marginal cost.

GRS Table 3 contains equilibrium profits for the two Firms. For $\theta=0.2$, Firm 2’s profit is given by GRS as 2.32 under independent pricing and 1.98 under bundled discounts. However, those are just profits over variable costs; fixed costs are not considered. Fixed costs, of course, must be covered.

Therefore, if Firm 2’s fixed costs are no greater than 2.32, it is viable under independent pricing. However, for Firm 2 to be viable under bundling, fixed costs must be no greater than 1.98. If Firm 2’s fixed costs are between 1.98 and 2.32, then it is viable under independent pricing, but not if Firm 1 uses bundled discounting. This is despite the fact that Firm 1’s bundled prices pass the attribution test.
### Table 1 - Bundled Discounts by Firm 1

<table>
<thead>
<tr>
<th>Independent Pricing</th>
<th>Bundling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>θ</td>
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<tr>
<td>0.20</td>
<td>3.90</td>
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<tr>
<td>0.40</td>
<td>3.90</td>
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<tr>
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<td>3.90</td>
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<tr>
<td>0.80</td>
<td>3.90</td>
</tr>
<tr>
<td>1.00</td>
<td>3.90</td>
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</table>

### Table 2 - Tied Pricing by Firm 1

<table>
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<tr>
<th>Independent Pricing</th>
<th>Tying</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>θ</td>
</tr>
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<tr>
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<tr>
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<td>3.90</td>
</tr>
<tr>
<td>1.00</td>
<td>3.90</td>
</tr>
</tbody>
</table>

### Table 3 – Firm 1 Profit Effects of Tying and Bundled Discounts

*Note: columns (1) and (2) are taken from GRS, Table 3*

<table>
<thead>
<tr>
<th></th>
<th>(1) Independent Pricing</th>
<th>(2) Bundled Discounts</th>
<th>(3) Tying</th>
</tr>
</thead>
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<td>6.36</td>
<td>6.90</td>
<td>5.56</td>
</tr>
</tbody>
</table>

### Table 4 – Market-wide Consumer Welfare Effects of Tying and Bundled Discounts

*Note: columns (1) and (2) are taken from GRS, Table 3*

<table>
<thead>
<tr>
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<th>(1) Independent Pricing</th>
<th>(2) Bundled Discounts</th>
<th>(3) Tying</th>
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</thead>
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<td></td>
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Demands: \(q_A(P_A) = 24 - 5P_A\), \(q_B(P_B) = 25 - 4P_B\)
Marginal Costs: $c_A = 3$, $c_B = 2$
Brand Preference: $k=5$

**Figure 1**
ProfitOneTying-ProfitOneInd

**Figure 2**
$\Theta = 0.6, k=5$

$\alpha = \text{Gainers}$
$\beta = \text{Losers}$
$\gamma = \text{Buy from Firm 2}$