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Tying and Bundled Discounts: An Equilibrium Analysis of Antitrust Liability Tests

David S. Sibley,^{*} Matthew D. Sibley,^{**} & Melanie Stallings Williams^{***}

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 One produces a monopoly product, A, and also another product, B, which competes with another version of B produced by Firm Two. The concern is the extent to which the price paid for A is linked to the purchase of B from Firm One. Has bundling products A and B 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 approach has been the subject of much recent discussion, but very little of the debate takes into account the effects of bundled discounts where all firms are setting prices to maximize profits, that is, in equilibrium. With homogeneous goods in the B market, the discount attribution test should be failed if 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 unhelpful when applied to bundled discounts, since in equilibrium there turns out to be no profit sacrifice. We explore related issues with tying arrangements.

The lack of legal clarity regarding bundled discounts matters because legal uncertainty has 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 detection and 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 scrutiny by courts, administrative agencies and scholars who have attempted to determine when bundling results in anticompetitive behavior, harming consumer welfare.¹ The main antitrust problem arises when 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, this paper focuses on the standards for determining when bundling constitutes unlawful competition under Section 2 of the Sherman Act.²

Currently, there is a circuit split over the standards to be used in resolving the problem, with the Third Circuit using the *LePage’s* exclusionary effects test³ while the Ninth⁴ and Sixth⁵ Circuits use the discount attribution test. The US Supreme Court denied the petition for certiorari in *LePage’s Inc. v. 3M*,⁶ possibly in part because the US Department of Justice and the Federal Trade Commission urged the court to wait for the economic and legal scholarship to develop.⁷ While courts have struggled with how to manage the antitrust questions arising from the practice of bundling, economic scholarship has developed various tests to determine when bundling reduces consumer welfare. And while courts have relied on these tests, economists have grappled with creating reliable analyses of a 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.⁸ The lack of judicial clarity regarding bundled discounts matters because legal uncertainty has 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.

The discount attribution test, the profit sacrifice test, and the Elhaug proposal are three leading approaches in analyzing how bundling affects consumer welfare. In all three tests, however, 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

1. “Welfare economics” is the “study of how the allocation of resources affects economic well-being.” N. GREGORY MANKIW, *PRINCIPLES OF MICROECONOMICS* 136 (7th ed. 2015). “Consumer welfare,” therefore, examines the economic well-being of consumers.

2. 15 U.S.C. § 2 (2004).

3. *LePage’s Inc. v. 3M*, 324 F.3d 141 (3d Cir. 2003) (en banc).

4. *Cascade Health Sols. v. PeaceHealth*, 515 F.3d 883, 906 (9th Cir. 2007).

5. *Collins Inkjet Corp. v. Eastman Kodak Co.*, 781 F.3d 264 (6th Cir. 2015).

6. *3M Co. v. LePage’s Inc.*, 542 U.S. 953 (2004).

7. Daniel L. Rubinfeld, *3M’s Bundled Rebates: An Economic Perspective*, 72 U. CHI. L. REV. 243, 243-44 (2005).

8. See *infra* Section V.B.

prices to maximize its profit, given the prices chosen by rivals.⁹ This paper attempts a more realistic and useful 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. In addition, the profit sacrifice test is unhelpful when applied to bundled discounts, since bundled discounts do not involve a profit sacrifice in equilibrium. The discount attribution test is tailored to the data that are typically available in an antitrust case. However, as we will discuss, the test can lead to questionable results when applied to equilibrium prices. 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 Two would have been viable absent the bundled discounts, and (2) whether the bundled discount plan would involve an exit (or deterred entry) by Firm Two.

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, 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.¹⁰ 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 to separately purchase a toothbrush or toothpaste or both.

9. 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).

10. *Collins Inkjet Corp.*, 781 F.3d at 273 ("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,¹¹ by contrast, leaves the consumer with no choice.¹² For example, if one can buy insulin 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.”¹³ A prima facie case of predatory pricing occurs when a seller prices its product below its average variable cost.¹⁴ Predatory pricing is often 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, that is, a level higher than would exist if competitors had not been forced from the market.¹⁵ Bundled discounts do not require the bundling firm to price below its cost, but like predatory pricing, bundling can force competitors to price below their costs.¹⁶

Bundling presents some of the same problems as tying. While bundling can create advantages for both buyers and sellers,¹⁷ there is a risk that sellers can reduce competition in the B market in violation of Section 2 of the Sherman Act.¹⁸ Bundling is attractive for sellers because it allows them to sell a greater quantity of products,¹⁹ to sell a greater variety of products,²⁰ to gain economies of scale,²¹ to increase the value of their brand,²² to reduce churn²³ (by

11. An invalid tying arrangement exists when “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).

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

13. *Ill. Tool Works Inc.*, 547 U.S. at 46.

14. *Cascade Health Sols. v. PeaceHealth*, 515 F.3d 883, 909-10 (9th Cir. 2007). “Variable cost” refers to those costs that change with the quantity of output (as compared with fixed costs which do not). MANKI, *supra* note 1, at 267-68. “Average variable cost” is the “variable cost divided by the quantity of output.” *Id.*

15. 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 the conspirators to forgo profits that free competition would offer them. The forgone profits may be considered an investment in the future.”).

16. See 15 U.S.C. § 2 (2004) (prohibiting monopolization in trade or commerce); HOVENKAMP, *supra* note 9, at 217-19 (noting that tying may constitute a violation of § 1 of the Sherman Act and § 3 of the Clayton Act).

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

18. *Cascade Health Sols.*, 515 F.3d at 897.

19. Jessica Darveau & Alain d’Astous, *Bundle Building in the Arts: An Experimental Investigation*, 31 PSYCHOL. & MARKETING 591, 593-94 (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. INDUS. ORG. 25, 37 (2013) (noting that bundling may allow increases in price).

20. Ryan Rahinel & Joseph P. Redden, *Brands as Product Coordinators: Matching Brands Make Joint Consumption Experiences More Enjoyable*, 39 J. CONSUMER RES. 1290 (2013).

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

increasing switching costs),²⁴ and to reduce transaction costs.²⁵ Successful bundling increases consumption of some goods beyond what would occur if the products were sold separately.²⁶ In one sense, almost all goods are bundled because they could presumably be broken down into component units to be sold,²⁷ which highlights the need to carefully define and identify the practice of bundling. Bundling is attractive to buyers because they can choose to get more goods for often reduced costs.²⁸ 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.²⁹ Bundling can therefore increase total welfare; both buyers and sellers can gain from the practice. Because of its ability to increase welfare, the practice should not be considered a per se violation of antitrust laws.³⁰

However, bundling can become predatory when bundles are priced so as to reduce competition.³¹ The classic circumstance (and the fact pattern common to most reported bundled discount cases)³² is when a seller has a monopoly on a

22. Shubin Sheng & Yue Pan, *Bundling as a New Product Introduction Strategy: The Role of Brand Image and Bundle Features*, 16 J. RETAILING & CONSUMER SERVS. 367 (2009).

23. See *Churn*, CAMBRIDGE DICTIONARIES ONLINE, <http://dictionary.cambridge.org/dictionary/english/churn> (follow “Business” hyperlink) (last visited Apr. 2, 2016) (defining “churn” as “the situation in which customers stop buying the products of services of a particular company, especially to buy them from a competitor”).

24. Jeffrey Prince & Shane Greenstein, *Does Service Bundling Reduce Churn?*, J. ECON. & MGMT. STRATEGY 839, 863 (2014). “Switching costs” refers to the cost of switching from one product or service to another. See Jean-Pierre Dubé et al., *Do Switching Costs Make Markets Less Competitive?*, 46 J. MARKETING RES. 436 (2009) (“Switching costs can come from a variety of sources, including product adoption costs, shopping/search costs, and psychological sources. For example, razor companies create switching costs between brands of razor blades by making handles or razors that fit only their blades.”).

25. David S. Evans & Michael Salinger, *Why Do Firms Bundle and Tie? Evidence from Competitive Markets and Implications for Tying Law*, 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 the transactions costs of marketing and consumer’s search costs by selling preferred packages of goods”) (footnote omitted).

26. Kathryn M. Sharpe & Richard Staelin, *Consumption Effects of Bundling: Consumer Perceptions, Firm Actions, and Public Policy Implications*, 29 J. PUB. POL’Y & MARKETING 170, 177 (2010) (studying the sale of fast food).

27. HOVENKAMP, *supra* note 9, at 216.

28. Evans & Salinger, *supra* note 25, at 41.

29. *Cascade Health Sols. v. PeaceHealth*, 502 F.3d 895, 905 (9th Cir. 2007) (“[T]he world’s largest corporations offer bundled discounts as their product lines expand with the convergence of industries . . . a street corner vendor with a food cart—a merchant with limited capital—might offer a discount to a customer who buys a drink and potato chips to complement a hot dog.”), *amended and superseded*, 515 F.3d 883 (9th Cir. 2007).

30. Herbert Hovenkamp, *Discounts and Exclusion*, 2006 UTAH L. REV. 841, 844 (2006).

31. *Cascade Health Sols.*, 502 F.3d at 911.

32. See, e.g., *LePage’s Inc. v. 3M*, 324 F.3d 141 (3d Cir. 2003) (noting 3M had a monopoly on branded cellophane tape but competed on bundled items); *Cascade Health Sols.*, 515 F.3d 883 (noting PeaceHealth had a monopoly on tertiary hospital services in the region but competed on primary and secondary acute care services); *Meijer, Inc. v. Abbott Labs.*, 544 F. Supp. 2d 995 (N.D. Cal. 2008) (involving alleged bundling of a patented pharmaceutical).

product (for example, because they hold a patent) and pairs it with a second non-monopoly product in a bundle. Critics charge that if the stand-alone price of the monopoly product (product A) is inflated, then the non-monopoly product (product B) will give the false appearance of being a bargain when bundled with the A product,³³ all to the harm of competitors of the B product. These competitors must price low enough to compensate buyers for lost discounts on the A product. This may force them to price below cost, as in predatory pricing. The price of A, in other words, can be manipulated so that the B product appears to be cheaper.³⁴ If a competitor making the second, non-monopoly product is forced from the market by the bundle, has there been an antitrust violation?³⁵ Alternatively, 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*.³⁶ Defendant 3M, the manufacturer of Scotch transparent tape, offered a discount when retailers' purchases of 3M products (including transparent tape 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; thus 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 LePage's.³⁷ There was no showing that the bundled rebate constituted a profit sacrifice on 3M's part.³⁸ Similarly, there was no showing that 3M engaged in predatory pricing,³⁹ that is, pricing below its cost. Nevertheless, the jury concluded that 3M's conduct amounted to maintenance of a monopoly in violation of Section 2 of the Sherman Act,⁴⁰ and the court entered a judgment

33. Rubinfeld, *supra* note 7, at 252.

34. "[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).

35. Shaun D. Ledgerwood & Wesley J. Heath, *Rummaging Through the Bottom of Pandora's Box: Funding Predatory Pricing Through Contemporaneous Recoupment*, 6 VA. L. & BUS. REV. 509, 546 (2012) ("[A] predatory pricing scheme funded by contemporaneous recoupment [of a paired product priced supra-competitively] may drive smaller competitors that are more efficient than the predator out of the market because small firms cannot recoup losses through higher churn across a broader product set.") (emphasis omitted).

36. 324 F.3d 141 (3d Cir. 2003).

37. *Id.* at 177 (Greenberg, J., dissenting) ("LePage's's economist conceded that LePage's is not as efficient a tape producer as 3M.")

38. *Id.* at 151 n.7.

39. *Id.* at 151.

40. *Id.* at 145.

for over \$68 million (after the jury's verdict was trebled), before adding interest.⁴¹ 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.⁴² As a result, a firm's bundling programs could be unlawful, the court held, even if the conduct reduced prices for consumers (thus increasing consumer welfare) and an equally efficient producer would apparently be able to match the prices.

The *LePage's* decision has been widely criticized⁴³ in part because its use of the test did not evaluate whether a bundled discount was pro-competitive (i.e., it increases consumer welfare by encouraging competition).⁴⁴ Instead, it simply declared that it was unlawfully anticompetitive if a monopolist offered bundles with a broader product line than did competitors.⁴⁵ The decision raised a debate over the standards used to determine monopolization because exclusion resulting from bundled discounts resembles both price predation (because the manufacturer is cutting prices for the bundle) and exclusionary conduct (in that it could result in foreclosing rivals in a manner similar to tying).⁴⁶ Despite the widespread comment and criticism, the US Supreme Court denied 3M's petition for certiorari in the matter.⁴⁷ Notably, the US 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 more developed.⁴⁸ A subsequent Third Circuit case declined to extend the *LePage's* test to cases other than bundling.⁴⁹

41. *Id.*

42. *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.").

43. See, e.g., ANTITRUST MODERNIZATION COMM'N, REPORT AND RECOMMENDATIONS 97 (2007) [hereinafter ANTITRUST MODERNIZATION COMM'N], available at http://govinfo.library.unt.edu/amc/report_recommendation/amc_final_report.pdf. For a comprehensive review, see Rubinfeld, *supra* note 7.

44. ANTITRUST MODERNIZATION COMM'N, *supra* note 43, at 97.

45. *Id.*

46. Jonathan B. Baker, *Preserving a Political Bargain: The Political Economy of the Non-Interventionist Challenge to Monopolization Enforcement*, 76 ANTITRUST L.J. 605, 614-15 (2010).

47. 3M Co. v. LePage's Inc., 542 U.S. 953 (2004).

48. Brief for the United States as Amicus Curiae at 19, 3M Co. v. LePage's Inc., 542 U.S. 953 (2004) (No. 02-1865), available at <http://www.justice.gov/atr/cases/f203900/203900.htm>. The department argued:

[A]lthough 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.

The next case to examine the anticompetitive effects of bundling was *Cascade Health v. PeaceHealth*.⁵⁰ 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.⁵¹ At issue was PeaceHealth's package of primary, secondary, and tertiary health care services with which Cascade Health could not compete.⁵² At trial, the court instructed the jury to use the *LePage's* exclusionary effects test: if a bundled discount offered by a monopolist included a more diverse product line than a competitor was able to offer, it was anticompetitive.⁵³ On appeal, the Ninth Circuit reversed. Using a discount attribution test,⁵⁴ the court allocated the bundle's discount to the competitive product, not the monopoly product. Thus, if the competitive product was priced below the bundler's cost, it is anticompetitive—the court 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.”⁵⁵

Whether the Ninth Circuit would continue to follow the discount attribution test was put in question by *Meijer, Inc. v. Abbott Laboratories*,⁵⁶ 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.⁵⁷ Also critical was the district court's reasoning in *Aerotec International, Inc. v. Honeywell International, Inc.*,⁵⁸ where, citing the facts of the case, the court noted that the high proportion of separate, unbundled sales prevented a finding of coercion.⁵⁹

Id.

49. *ZF Meritor, LLC v. Eaton Corp.*, 696 F.3d 254, 274 n.11 (3rd Cir. 2014).

50. 515 F.3d 883 (9th Cir. 2007).

51. *Id.* at 891.

52. *Id.* at 892-93.

53. *Id.* at 910.

54. The discount attribution test—discussed more fully *infra* Section III.A—applies the full discount of a bundled product to the competitive product within that bundle. If, after the discount is applied, the competitive product is priced below the seller's cost, the test has shown that the conduct may be unlawfully exclusionary.

55. *Cascade Health Sols.*, 515 F.3d at 909.

56. 544 F. Supp. 2d 995 (N.D. Cal. 2008).

57. *Id.* at 1004.

58. 4 F. Supp. 3d 1123 (D. Ariz. 2014).

59. The *Aerotec* court observed that in *Cascade Health*, “only 14% of customers made separate purchases” while, in *Aerotec*, at least 46% of the sales were separate. *Id.* at 1134. In fact, the decision noted, the percentage was so high that “the court actually presumes that Honeywell has not engaged in tying.” *Id.* The court appears to use the terms tying and bundling interchangeably, noting that the plaintiff alleged illegal tying, but then engaged in a bundling analysis. *Id.* at 1132-34.

However, an affirmation of *Cascade Health's* use of the discount attribution test came more recently in the Sixth Circuit's decision in *Collins Inkjet Corp. v. Eastman Kodak Co.*⁶⁰ In a tying case (and noting that the analysis was the same as that used for bundling), the court noted that the Ninth Circuit's *Cascade Health* analysis was more compelling than the Third Circuit's *LePage's* analysis,⁶¹ finding the discount attribution standard appropriate for "ties enforced purely through differential pricing."⁶²

Clearly, courts are struggling for a consensus on the tests to be used in determining when bundled discounts are anticompetitive,⁶³ with the leading options being 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,⁶⁴ 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 plaintiff unable to continue to operate profitably),⁶⁵ and an extension of the *Brooke Group*⁶⁶ 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.⁶⁷ The lack of consensus on the standards required of this very common commercial practice makes bundling a more precarious undertaking,⁶⁸ harming both businesses and consumers.

60. 781 F.3d 264 (6th Cir. 2015).

61. *Id.* at 273.

62. *Id.* at 274.

63. The Eighth Circuit sidestepped an opportunity to determine the appropriate test to analyze an allegedly anticompetitive bundling case in *Se. Mo. Hosp. v. C.R. Bard, Inc.*, 642 F.3d 608 (8th Cir. 2011). For a discussion, see Melissa A. Cullmann, *Eighth Circuit Bungles Bundled Discounts: The Court Avoids Resolving Bundled Discounts*, 78 MO. L. REV. 299 (2013).

64. The Antitrust Modernization Commission ("AMC") recommended:

Courts 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.

ANTITRUST MODERNIZATION COMM'N, *supra* note 43, at 99. The *Cascade* court adopted the discount attribution test portion of the test but declined to adopt the remainder of the AMC's proposed test.

65. *Ortho Diagnostic Sys., Inc. v. Abbott Labs., Inc.* 920 F. Supp. 455, 469 (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").

66. *Brooke Grp. Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209 (1993).

67. Jaeckel, *supra* note 17, at 48 (noting that 3M advocated the use of this test in *LePage's*).

68. *Id.* at 46; see also Richard M. Steuer, *Bundling Beyond Borders*, 24 ANTITRUST ABA 40, 44 (2010) (noting that "[t]he law on bundled discounts is a moving target in every jurisdiction").

C. *The Consumer Welfare Standard*

Antitrust laws, it has been noted, protect competition, not competitors.⁶⁹ What interests are the antitrust laws intended to protect? It is unclear what the framers' intent was when the Sherman Act⁷⁰ was created in 1890. Determining whose interests to protect—businesses, consumers, or both—matters because it drives the underlying analysis. A general welfare test would require a balancing of gains against losses of everyone (including both buyers and sellers)⁷¹ and a decision reached accordingly. By contrast, the late Professor Bork asserted that antitrust law should adopt a consumer welfare standard (i.e., an examination of how the behavior affected the economic welfare of consumers) to determine illegal anticompetitive conduct, but he equated this with a general welfare standard.⁷² 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.⁷³ The US Supreme Court cases indicate that consumer welfare is the controlling standard.⁷⁴ 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.⁷⁵

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.⁷⁶

A brief example helps illustrate the point: consider a model with two firms, as outlined at the beginning of the article. Firm One produces a monopoly product (product A) and a product that faces competition from Firm Two (product B). The two firms make differentiated versions of B, and some consumers prefer one to the other. Therefore, consumers do not make buying

69. *Bathke v. Casey's Gen. Stores, Inc.*, 64 F.3d 340, 344 (8th Cir. 1995).

70. 15 U.S.C. §§ 1-7 (2004).

71. Herbert Hovenkamp, *Implementing Antitrust's Welfare Goals*, 81 *FORDHAM L. REV.* 2471, 2472-73 (2013). In discussing "general welfare" (also called "total welfare"), Hovenkamp notes that the term "refers to the aggregate value that an economy produces, without regard for the way that gains or losses are distributed" while consumer welfare "looks only at the surplus that goes to consumers, ignoring what goes to sellers." *Id.* at 2471-72.

72. ROBERT H. BORK, *THE ANTITRUST PARADOX: A POLICY AT WAR WITH ITSELF* 66, 97 (1978).

73. For a robust discussion, see Hovenkamp, *supra* note 71.

74. *NCAA v. Bd. of Regents of Univ. of Okla.*, 468 U.S. 85, 107 (1984); *see also Arizona v. Maricopa Cty. Med. Soc'y*, 457 U.S. 332, 367 (1982) (Powell, J., dissenting). For a thorough discussion, see Einer Elhauge, *Tying, Bundled Discounts, and the Death of the Single Monopoly Profit Theory*, 123 *HARV. L. REV.* 397, 435-40 (2009).

75. HOVENKAMP, *supra* note 9, at 216 (discussing tying).

76. *See infra* Part V.

decisions based only on prices, but also on which brand they prefer. Some customers buy both A and B (A-and-B customers) and some buy only B (B-only customers).⁷⁷ Under independent pricing, Firm One sets the monopoly price for A and both firms price their versions of B above marginal cost.

Now suppose that Firm One 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 product B from Firm One. In order for Firm One to make money on bundled customers, it must offset its profit losses on discounted product A by elevating the bundle price of B above where it would be under independent pricing. Some A-and-B customers prefer Firm Two's version of B strongly enough that they are not attracted to the bundle. Therefore, Firm One sets a "standalone" (i.e., a non-bundled) price of A that is more attractive than the bundle to an A-and-B customer who prefers Firm Two's version of B. This standalone price is higher than the pre-bundling monopoly price of A.

How does Firm Two react to all this? Its main strategic goal is to keep as many customers as possible out of Firm One's bundle. Therefore, in the new bundling equilibrium, Firm Two cuts its price. This helps it to retain at least some A-and-B customers, who will have to buy A at the standalone price, and it pulls some B-only customers away from Firm One. Even in this relatively simple setup, different customers are affected in different ways:

- A-and-B customers whose B preference is strongly towards Firm One 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 Two, select the bundle to avoid paying the high standalone price for A, but are worse off than in the independent pricing equilibrium.
- Some A-and-B customers prefer Firm Two so strongly that they are willing to buy A at the high standalone price in order to get B from Firm Two. They are worse off under bundled discounts.
- B-only customers who prefer Firm One are worse off, because Firm One elevates its price of B in the bundling equilibrium.
- B-only customers who prefer Firm Two are better off than they were under independent pricing, because Firm Two lowers its B price to compete with the bundle.

We analyze, *infra*,⁷⁸ examples where aggregate consumer welfare is higher under bundling than under independent pricing. However, each of the above five types of outcomes exist in each of those examples, and those who are

77. This model is laid out *infra* Part V.

78. See *infra* Section V.A.

worse off in each case can 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 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 may be difficult to do in practice. This implies 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*.⁷⁹ 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 One’s decision to bundle.

III. EQUILIBRIUM ANALYSIS OF THESE APPROACHES

Because the few relevant decisions are conflicting,⁸⁰ 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 analysis of relevant economic results on tying and bundled discounts, refer to the appendix.

A. Discount Attribution Test

The best-accepted approach to analyzing bundled discounts is the discount attribution test employed in *Cascade Health*.⁸¹ The discount attribution test applies the full discount to the competitive product in the bundle (product B in our hypothetical).⁸² If, after the discount is applied, the price of the competitive product is below the seller’s cost, the seller has failed the test and the conduct may be unlawfully exclusionary.⁸³ This assumes that all firms have the same marginal cost for product B and that it is well approximated by average

79. See *infra* Section III.C.

80. For a comparative law discussion of bundling, see Steuer, *supra* note 68.

81. *Cascade Health Sols. v. PeaceHealth*, 515 F.3d 883, 906 (9th Cir. 2007).

82. *Id.*

83. *Id.*

variable cost (AVC). Denoting Firm One's B price by P_1 , the discount attribution test is passed if:

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

where c_B is average variable cost.

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 One, could profitably undercut the bundle at a price at or above marginal cost. It would presumably not be anticompetitive because Firm Two could price B at or below Firm One's bundled price of B and still make a profit. If Firm One's prices pass this test, then the plaintiff bears the burden of showing why it cannot compete with Firm One's prices.

Implementation issues with the attribution test have been summarized clearly and comprehensively by Professor Economides.⁸⁴ Here, the focus is conceptual. To begin, consider the well-known example of shampoo and hair conditioner, from the decision in *Ortho Diagnostic Systems, Inc. v. Abbot Laboratories, Inc.*⁸⁵ Firm One sells both shampoo and hair conditioner and Firm Two only sells shampoo. If a consumer buys shampoo and conditioner from Firm One separately, he or she pays \$3 for the shampoo and \$4 for the conditioner. 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 One as a bundle, the prices are \$2.25 for shampoo and \$3.00 for conditioner. Under the discount attribution test the bundle discount on conditioner, \$1.00, is subtracted from Firm One's price of shampoo, \$2.25. The result, \$1.25, exceeds Firm One's marginal cost of shampoo, \$1.00. Therefore, Firm One's bundled discount plan is presumably lawful because it passes the discount attribution test.

However, there is a problem with this conclusion because the numbers also imply that Firm Two can undercut the bundle profitably. For example, it can charge \$1.10 for shampoo, giving it a unit profit of \$0.10. At this price, a consumer can afford to buy shampoo from Firm Two and to pay the undiscounted price of \$4.00 for conditioner and still pay less for each product (a total of \$5.10) than the \$5.25 Firm One charges for the bundle. Consequently, Firm One would make no sales of shampoo and 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 requires that each firm choose its prices so as to maximize its profit, given the prices set by the other firm. To see

84. See Nicholas Economides, *Tying, Bundling and Loyalty/Requirement Rebates*, in RESEARCH HANDBOOK OF THE ECONOMICS OF ANTITRUST LAW 121 (Einer Elhauge ed., 2012).

85. 920 F.Supp. 455, 467 (S.D.N.Y. 1996).

why, suppose that Firm One raises the standalone price of conditioner from \$4 to \$5. The apparent discount on conditioner when buying the bundle is now \$2.00 and the discount attribution test is failed, because $\$2.25 - \$2.00 = \$0.25$, which is less than \$1.00, the marginal cost of shampoo for both firms. Firm Two sells nothing, because it cannot charge more than \$0.25 for shampoo, which is below its marginal cost of \$1.00. Firm One now sells both conditioner and shampoo to each consumer at the bundled price of \$5.25, and its profit has gone from \$2.00 to \$2.25 (i.e., $\$5.25 - \$2 - \$1 = \2.25). By deviating from the initial prices in the example, Firm One can raise its profit above the initial \$2.00, given Firm Two's price. Hence, the hypothesized initial prices in the example cannot be equilibrium prices because they do not maximize profits for Firm One. 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 One need only raise the standalone 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 Two cannot compete in the market for B, and is therefore 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 firms are differentiated from each other, so that some consumers have a strong preference for one version over the other, but other consumers may have only a mild preference. 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 One's bundled discount price of B 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, because bundled discounts lower profits for Firm Two. Assume that Firm Two's fixed costs are low enough that Firm Two is viable when Firm One prices independently, but too high for it to be viable when Firm One uses a bundled discount plan.⁸⁶ That is, faced with bundled discounts by Firm One, Firm Two may be able to price high enough to cover variable costs, but still fail to cover fixed costs. Since Firm One's bundled discount plan passes the discount attribution test, one might suppose that Firm Two can profitably undercut Firm One's bundled discount plan. However, in equilibrium, Firm Two is already pricing so as to maximize profits, given the bundled discount

86. For a numerical example, see *infra* Section V.C.

plan of Firm One. 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 One's price of B (adjusted for lost discounts on A). Hence, there is no "fix" for Firm Two that makes it solvent, even though the discount attribution test is passed.⁸⁷

This does not mean that the discount attribution test is not useful. However, its results must sometimes 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 Two cannot compete against the plan, even if it is equally efficient. Does this mean that the plan reduces competition? Not necessarily. Suppose that Firm Two can produce the A product, but has simply decided not to do so. If it does produce A, it can neutralize Firm One's bundled discount plan, and the two firms can compete on bundles. Therefore, to show that a bundled discount plan harms competition, the discount attribution test must be failed and there must be a barrier to entry into the A market. However, if the discount attribution test is passed, this does not necessarily mean that the bundled discount plan is benign. As we have seen, in a differentiated products equilibrium, bundled discounts by Firm One can leave Firm Two unable to cover fixed costs, even though the test is passed. Depending on the circumstances, other types of background information may be necessary in determining whether a bundled discount is anticompetitive.

B. Profit Sacrifice Test

The profit sacrifice test (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,⁸⁸ but it has come to be a general test for monopolization under Section 2 of the Sherman Act.⁸⁹ Melamed⁹⁰ has argued that the PST is the best approach to distinguishing lawful from unlawful behavior in a monopolization case.⁹¹ 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.⁹² If the conduct would not be profitable absent a

87. To analyze Firm Two's viability, the spirit of *Cascades Health* suggests using Firm One's fixed costs attributable to its B product line only.

88. The test was first articulated in Janusz A. Ordover & Robert D. Willig, *An Economic Definition of Predation: Pricing and Product Innovation*, 91 YALE L.J. 8 (1981).

89. *But see* U.S. DEP'T OF JUSTICE, COMPETITION AND MONOPOLY: SINGLE-FIRM CONDUCT UNDER SECTION 2 OF THE SHERMAN ACT 39-43 (2008), available at www.usdoj.gov/atr/public/reports/236681.htm (recommending that a profit sacrifice test not be used to determine Section 2 liability). The report was withdrawn May 11, 2009.

90. A. Douglas Melamed, *Exclusionary Conduct Under the Antitrust Laws: Balancing, Sacrifice, and Refusals to Deal*, 20 BERKELEY TECH. L.J. 1247 (2005).

91. *Id.* at 1255.

92. *Id.*

reduction in competition, then the inference must have been intended to exclude rivals who would otherwise remain viable, constituting anticompetitive conduct.⁹³ Cabral and Riordan equate predation with profit sacrifice.⁹⁴ They call an action predatory if (1) a different action would increase the likelihood that rivals remain viable, and (2) the different action would be more profitable under the counterfactual hypothesis that the rival's viability were unaffected.⁹⁵ 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.

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 One. Initially, Firm One 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 others buy only B. Then suppose that Firm One institutes a tying requirement. 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, or getting B at marginal cost but doing without A altogether, A-and-B customers likely choose the tying arrangement. Customers who buy only B just switch to other firms. Firm One's profit goes up by doing this, and the B market remains as perfectly competitive as it was before.⁹⁶ 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. Whinston⁹⁷ analyzes tying in a model⁹⁸ that can be applied to deterring entry or to inducing exit by an incumbent Firm Two. Whinston begins by showing that if both firms are active in the market, Firm One's profit is less than or equal to its profit if it priced independently. The model has three stages:

93. 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. *Id.* at 1255 n.20.

94. Luis M. B. Cabral & Michael H. Riordan, *The Learning Curve, Predation, Antitrust, and Welfare*, 45 J. INDUS. ECON. 155 (1997).

95. *Id.* at 160.

96. Patrick Greenlee, David Reitman & David S. Sibley, *An Antitrust Analysis of Bundled Loyalty Discounts*, 26 INT'L J. INDUS. ORG. 1132, 1135, 1137-38 (2007).

97. Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837 (1990).

98. 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. *See id.*

Stage 1: Firm One 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 have the same valuation for one unit of the monopoly A product. Tying in this framework means a package tie-in:⁹⁹ selling A and B in a single package containing one unit of each product. Whinston assumes that Firm One can credibly pre-commit to tying its A and B products if it chooses. This is necessary because Whinston shows that if Firm One ties in this manner, and both firms are active, then both firms' equilibrium profit levels are no higher than if Firm One had priced A and B independently. Absent such a pre-commitment, Firm Two will assume that Firm One will price independently and will not be excluded. Thus, Firm One does better by refraining from tying and instead using independent pricing. However, if Firm One can credibly bind itself (i.e., pre-commit) to tying no matter what, then Firm Two will exit (or not enter) if its fixed costs are excessive. Firm One will then be a B monopolist of the package.

Therefore, it is clear that when Firm One pre-commits to a tie, there is a cost to doing so. If Firm Two is active and Firm One ties, Firm One's profit is no higher than if it had priced independently. Even if Firm Two is not active, Firm One's monopoly status is limited, because it is only a monopolist of a bundle. If enough B customers dislike Firm One'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 One, as a bundle monopolist, may be less profitable than it would be under independent pricing against an active Firm Two.

With this in mind, if Firm One pre-commits to tying, this only increases Firm One's profit if the pre-commitment excludes Firm Two. Otherwise, Firm One does better with independent pricing. Therefore, depending on the magnitude of Firm Two's fixed costs, there are two possible equilibrium outcomes in the Whinston model. First, if Firm Two's fixed costs are low enough that it can make a positive profit against tying and Firm One knows this, then Firm One will not pre-commit to tie in Stage 1. Accordingly, there is no exclusion. In Stage 2, both will enter and there is independent pricing in Stage 3. However, if Firm Two's fixed costs are high enough to

99. See, e.g., U.S. DEPT. OF JUSTICE & FED. TRADE COMM'N, ANTITRUST ENFORCEMENT AND INTELLECTUAL PROPERTY RIGHTS: PROMOTING INNOVATION AND COMPETITION 103 (2007), available at <http://www.justice.gov/sites/default/files/atr/legacy/2007/07/11/222655.pdf> (noting that bundling is sometimes referred to as a "package tie-in").

make it non-viable in Stage 3 given tying by Firm One, then the resulting equilibrium is that Firm One pre-commits to tying in Stage 1. This pre-commitment deters entry (or induces exit) by Firm Two in Stage 2, and Firm One becomes a bundle monopolist in Stage 3.

Thus, if Firm One ties in this scenario, the tying arrangement fails the PST. Assuming that both firms were active in Stage 3, tying is less profitable for Firm One than independent pricing. Hence, the success of tying in deterring entry (or inducing exit) by Firm Two involves a profit sacrifice when compared to the alternative world in which Firm Two is active in Stage 3. That is, the profit sacrifice is discovered by considering what would have happened with independent pricing, but for the existence of a tie or bundle (i.e., the “but-for” condition).

2. *Applying the PST to Bundled Discounts*

As shown above, bundled discount pricing is at least as profitable for Firm One as is independent pricing. For this reason, to the extent that a given bundled discount plan lowers Firm Two’s profit to the point that it becomes negative, this does not involve a profit sacrifice by Firm One. 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 One will always find bundled discounts to be superior to independent pricing. Instead, the relevant stages are Stage 2 and Stage 3. With both firms active in Stage 3, there is a bundled discount equilibrium. Therefore, working back to Stage 2, Firm One definitely enters and Firm Two enters if and only if its profits in such an equilibrium allow it to cover its fixed costs.

Clearly, bundled discounts can exclude competition because Firm Two’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 One, so the PST is useless in this situation. Note 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 identify 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. Recently, one of the most discussed models is that of Professor Elhauge, who put forward a novel proposal for dealing with bundled discounts.¹⁰⁰ First, he argues that the case law on tying implies a consumer welfare standard and that tying claims per se

100. Elhauge, *supra* note 74.

violate this standard unless consumers use products A and B in fixed proportions.¹⁰¹ Second, he asserts that if a bundled discount plan includes a standalone price of product A exceeding the monopoly price of A under independent pricing, 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 (GRS).¹⁰² GRS note that if the B market is perfectly competitive, then the price of B from any seller other than Firm One is unchanged by Firm One adopting a bundled pricing plan: price will always equal marginal cost for any other seller of B.¹⁰³ Therefore, if Firm One adopts a bundled discount plan in which the standalone 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.¹⁰⁴ On the other hand, if the standalone price of A is above the pre-bundling monopoly price of A, GRS show that all A-and-B customers must be worse off.¹⁰⁵ B-only customers can always buy B from a rival at marginal cost, so they are unaffected. Comparing the standalone 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 standalone price of A (P_A) exceeds the but-for (or pre-bundling monopoly) price of A, its only purpose is to move A-and-B consumers into the bundled discount prices.¹⁰⁶ GRS point out that in this setting, the bundled discount plan is equivalent to a tying arrangement.¹⁰⁷ Thus, if the B market is perfectly competitive, Elhauge's proposal correctly implements his view that antitrust law implies a consumer welfare standard.¹⁰⁸ If the GRS test is passed, all consumers are better off. If it is failed, all consumers are worse off.

However, the clear and straightforward 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:¹⁰⁹

- In all the simulations performed by GRS, equilibrium profits for Firm One under bundled discounts are higher than under independent pricing.¹¹⁰

101. *Id.* at 443. If A and B are used in fixed proportions, then the One Monopoly Rent Theorem applies, and the tying arrangement is presumably benign.

102. *Id.* at 409-10.

103. *Id.* at 413.

104. Greenlee, Reitman & Sibley, *supra* note 96, at 1136.

105. *Id.* at 1137.

106. *Id.* at 1138.

107. *Id.* at 1149.

108. Elhauge's policy would also work if the B market were an oligopoly with at least two firms other than Firm One, and where consumers all go to the firm with the lowest price.

109. *See infra* Section V.A.

- The standalone price of A is higher than the but-for price in equilibrium, thus failing 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 One if both firms are active in the B market. However, bundled discounts are always profitable compared to independent pricing. Therefore, it doesn't make sense to treat bundled discounts as if they were ties in such cases. Second, even when the standalone price exceeds the previous monopoly price, then, as described above, 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 standalone 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 way by tying or bundled discounts. That is, nearly all consumers are better off or nearly all are worse off. This condition is not met for the differentiated duopoly case, as illustrated by this article's discussion of tying, bundled discounts, and independent pricing.¹¹¹

These difficulties with a consumer welfare standard do not arise, of course, if one interprets Section 2 of the Sherman Act as meaning that the focus of analysis is whether or not a tying arrangement or bundled discount plan reduces competition. This article now discusses the issues that arise in this more traditional interpretation of Section 2.

D. Application of the 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 that "(1) 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."¹¹² Assuming that there is no documentary evidence, specific intent can only be inferred from the actual bundled discount prices and their effects on Firm Two's viability. Specifically, were the prices involved in the bundle (the

111. *See infra* Part V.

112. *Spectrum Sports, Inc. v. McQuillan*, 506 U.S. 447, 456 (1993).

standalone price of A, the bundle discount on A and the price of B) chosen to induce Firm Two to exit? From an economic standpoint, Firm Two exits if and only if its gross profits in equilibrium do not cover its fixed costs; thus finding specific intent amounts to asking whether equilibrium pricing with bundled discounts is affected by Firm Two'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 One.

Assume that initially Firm One prices independently and Firm Two is viable in that situation. Then Firm One switches to bundled discounts, lowering Firm Two's profits as a result. Whether Firm Two exits the market depends on whether its revenue covers both variable and fixed costs. Firm One sets the same prices if Firm Two has no fixed costs at all (and cannot be excluded) as it would if Firm Two's fixed costs are high enough that Firm Two cannot survive¹¹³. Therefore, nothing in the equilibrium pricing of Firm One is at all illuminating about whether there was a specific intent to monopolize.

The outcome is different for tying in the differentiated duopoly model. As long as Firm Two is active in the B market, Firm One does worse with tying than with independent pricing. Therefore, Firm One pre-commits to tying only if Firm Two is likely to conclude that subsequent competition with Firm One 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. The lack of legal guidance creates uncertainty in the market, with firms being given inconsistent—and sometimes contradictory—standards on how to avoid antitrust liability.

First, this paper differs from other economic analyses by using a more realistic model: it examines 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 characterized by marginal cost pricing, our model departs from traditional practice by replacing this tied market assumption with the more realistic differentiated duopoly model, allowing for strategic interaction between the duopolists.

113. Whinston, *supra* note 97 (making the same observation about tying).

Second, economic results on the profitability of tying imply that one should be cautious about using 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, tying is not profitable in a differentiated duopoly case, 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 (by itself) does not tell us anything about Firm Two's competitive viability 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 unhelpful when applied to bundled discounts because this type of pricing does not involve a profit sacrifice.

Fifth, we have shown that the specific intent test for attempted monopolization is generally not useful for analyzing bundled discounts. Neither the adoption of bundled discounts as a strategy nor the specific prices chosen are influenced by Firm Two's fixed costs. It is the latter that determine whether Firm Two exits the market. For tying, however, the opposite is true in the Whinston model. Although Firm Two's fixed costs do not affect the specific levels of the tied prices, the decision to use tying in the first place is based entirely on Firm Two's fixed costs and their likely impact on a decision by Firm Two to exit. Hence, if the B market follows the differentiated duopoly model used herein, the use of a tie¹¹⁴ implies specific intent to monopolize and would support an attempted monopolization claim.

The implications of these results for antitrust 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 or nearly so. 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

114. Absent the possible efficiencies of tying first described by Ward S. Bowman in *Tying Arrangements and the Leverage Problem*, 67 *YALE L.J.* 19, 21-23 (1957).

consumer harm. As such, it would 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 standalone price of A exceeds the but-for price. Therefore, applying Elhauge's rule would lead to a perverse result. The discount attribution test would be uninformative because a bundled discount plan that passes it could also lead to exit by Firm Two.

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 have to determine (1) whether Firm Two would have been viable absent the bundled discounts; and (2) whether the bundled discount plan at issue involve exit or deterred entry by Firm Two. 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 under conditions that more realistically approximate 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. With more useful economic models, the legal scholarship can develop to provide clearer standards to businesses so that liability risks are reduced and pro-competitive bundling practices are no longer discouraged.

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.¹¹⁵ Members of the population of B consumers have varying preferences regarding Firm One and Firm Two. Setting aside price effects, some have strong preferences for one firm or the other while some have preferences that do not strongly favor either firm. 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 One will buy at Firm Two if its price is low enough relative to Firm One's B price.

115. See Harold Hotelling, *Stability in Competition*, 39 ECON. J. 41 (1929).

In this model, each consumer has a taste parameter denoted by t , which reflects his or her preferences between Firm One and Firm Two in the B market. If a consumer has a t value close to zero, he or she strongly prefers Firm One; a t value close to 1 indicates a preference for Firm Two. A consumer whose taste for B is at, say $t = 1/3$, prefers Firm One to Firm Two, 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 One and by k times $2/3$ if he or she buys from Firm Two. One can think of k as measuring the extent to which a consumer 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 the 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 $1-\theta$ (B-only) customers have preferences between Firm One and Firm Two as described above. For further technical details on the model setup, see section 7 in GRS.¹¹⁶

B. Simulations of Bundled Discounts versus 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 calculations¹¹⁷ for the effects of bundled discounts compared to independent pricing. Consider first independent pricing. The monopoly price of A is \$3.90 and the equilibrium price in the B market is \$2.29 for each firm; each firm's marginal cost of B is \$2.00. Each firm sells to half the B market. Firm One sells to those whose tastes are located closer to it than to Firm Two; that is, Firm One sells to customers located between $t = 0$ and $t = 1/2$. Firm Two sells to the other half of the B market (i.e., from $t = 1/2$ to $t = 1$).

GRS consider bundled discounts that allow all customers who buy their B product from Firm One to get a discount on the monopoly good, A.¹¹⁸ 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 60 percent, for example, table 1 shows that the standalone price of

116. Greenlee, Reitman & Sibley, *supra* note 96, at 1144-49.

117. Greenlee, Reitman & Sibley, *supra* note 96.

118. *Id.* at 1135.

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 (\$3.90). The B price charged by Firm One with bundling rises to \$2.35, and it is paid by all customers who buy B from Firm One, whether or not they also buy A. Firm Two lowers its price for B to \$2.24, as compared to \$2.29, which was Firm Two's equilibrium price when Firm One priced A and B independently.¹¹⁹ Firm Two lowers its price to this level in order to better compete with Firm One's bundled discount pricing.

Table 3 shows the equilibrium profits of both firms under independent pricing and bundled discounts. Firm One's profits are always higher under bundled discounts than under independent pricing; Firm Two's prices are lower. Table 4 shows aggregate consumer welfare, averaged over all customers, whether they bought B from Firm One or Firm Two. Bundled discounts lead to higher average consumer welfare than independent pricing does. GRS also show that bundled discounts in their simulations reduce Firm Two's profits.¹²⁰

These simulation results are only special cases of a more general result: in the differentiated duopoly setting, Firm One 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, ϵ, P_1) . P_A is the standalone price of A, ϵ is the bundle discount on A, and P_1 is Firm One's price on the B market. If a consumer buys B only from Firm One, that consumer only pays $P_A - \epsilon$ for A. But if the consumer buys any B from Firm Two, he or she must pay P_A . With $\epsilon = 0$, (i.e., no bundle discount) 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 are at the same levels as under independent pricing because consumers' purchase decisions for B are de-linked from the price of A with $\epsilon = 0$. Hence, the bundled discount plan reproduces the independent pricing equilibrium. If Firm One has a nontrivial plan (i.e., with $\epsilon > 0$), we can infer that its profit is higher than under independent pricing.

C. Tying versus Independent Pricing

Whinston¹²¹ has analyzed the effects of tying in a model in which each consumer buys at most one unit of A or B and where the B market consists of

119. Some B-only consumers buy from Firm One even though its price of B is higher than Firm Two's price because their basic preferences heavily favor Firm One. That is, they have values of t less than $1/2$.

120. *Id.* at 1147.

121. Our model of tying is basically the same as that of Whinston, *supra* note 97. 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.

two firms, one of which (Firm One) also is an A monopolist. Tying in this setting is a package tie-in, in which the tying firms sell 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 One to tie is to possibly exclude Firm Two from the market. Since tying is not optimal for Firm One if it finds itself facing an un-excluded Firm Two competing in the B market, it can only exclude Firm One if it can credibly pre-commit to tying. That is, it must commit to tying even if it were to face an active Firm Two. If it can do so, then it can convince Firm Two that it will tie even if doing so results in a profit sacrifice compared to independent pricing. Firm Two then contemplates its prospectively lower profits and exits the B market if it will be unable to cover its fixed costs under these conditions.

We have extended Whinston's analysis (very slightly) to allow for requirements tying, in which consumers can buy multiple units of A and B, and not in fixed proportions. 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 One and Firm Two are both active, they each earn lower profits than with independent pricing.¹²² Representative results are shown in figure 1 and in table 1. Hence, absent the ability to pre-commit to a tie, there is no incentive to tie in the independent demands setting.¹²³

D. Disaggregating the Consumer Welfare Effects of Bundled Discounts

We have mentioned the fact that in a differentiated duopoly equilibrium, Firm Two 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.¹²⁴ Because Firm Two reacts in this way, even consumers who do not choose to buy at the bundled prices are indirectly affected by them in equilibrium. In the case where 60 percent of B consumers also value A, 40 percent of B customers do not value A at all. Some of that 40 percent also prefer Firm Two's version of B at the equilibrium prices. These consumers pay a lower price to Firm Two due to Firm One's bundled discounts and are better off than under independent pricing, even though they do not buy

122. David S. Sibley & Matthew D. Sibley, *Tying and Bundled Discounts: An Equilibrium Analysis of Antitrust Liability Tests – Technical Version* (Dec. 29, 2011) (matlab code) (on file with authors).

123. This assumes that A and B are not complements.

124. Cf. John Thanssouliis, *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. Thanssouliis 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.

from Firm One at all. B-only customers who have a strong preference for Firm One 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 Two in the B market.

Figure 2 examines the impact of bundled discounts on the subset of consumers who would buy both A and B under independent pricing. It assumes that 60 percent of B customers buy A, or $\theta = 0.6$.¹²⁵ As a benchmark, the dashed curve shows consumer welfare for different types of A-and-B customers under independent pricing by Firm One. As we have noted above, with independent pricing, all consumers of B pay the same price of 2.29 in equilibrium, and those who also value A all buy it at the price 3.9. Notice that consumer surplus¹²⁶ (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 One, but as one moves closer to $t = 1/2$, customer preferences become relatively less favorable to Firm One's version of B. After that point, consumers with $t > 1/2$ select Firm Two, and we get to A-and-B customers whose tastes in B are closer and closer to the product sold by Firm Two. Hence, the dashed line rises from $t = 0.5$ 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 One.

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 One are induced to buy B from Firm One in order to get the bundled discount on A. At roughly $t = 0.77$, the solid curve turns up. This is the point at which the consumer is indifferent between buying B from Firm One (and getting the bundled discount on A) and buying B from Firm Two, and paying the higher standalone price for A. For consumer types greater than 0.77, it is better to buy B from Firm Two and pay the higher standalone price for A. Notice that at about $t = 0.68$ the solid curve crosses the dashed curve from above. This means that A-and-B customers whose tastes are located below 0.68 are better off under the bundled discount arrangement than under independent pricing; so are B-only customers who buy from Firm Two. Other A-and-B customers are worse off, as are B-only customers who buy from Firm One. Thus, once again, bundled discounts will often benefit some customers, while harming others.

125. That is, it does not show consumer welfare for those customers who buy no A under independent pricing.

126. MANKIW, *supra* note 1, at 137 ("Consumer surplus measures the benefit buyers receive from participating in a market.").

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 θ A-and-B customers who buy B in Firm One's bundle. Let t_{B0} be the fraction of the $1-\theta$ B-only customers who buy from Firm One. These terms are presented mathematically in GRS equations (13) and (14).¹²⁷ 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),¹²⁸ 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 Two's marginal cost.

GRS table 3¹²⁹ contains equilibrium profits for the two firms. For $\theta = 0.2$, Firm Two'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 Two's fixed costs are no greater than 2.32, it is viable under independent pricing. However, for Firm Two to be viable under bundling, fixed costs must be no greater than 1.98. If Firm Two's fixed costs are between 1.98 and 2.32, then it is viable under independent pricing, but not if Firm One uses bundled discounting. This is despite the fact that Firm One's bundled prices pass the attribution test.

F. Tables and Figures

The results reported here are for simulations that assumed the following about the behavioral relationships in the model: (1) $q_A = 24 - 5P_A$ and $q_B = 25 - 4P_B$; (2) $k = 5$; (3) $c_A = 3$, $c_B = 2$. The results for bundled discounts and independent pricing are taken from GRS tables 2 and 3.¹³⁰ The tying results were calculated by the authors.

127. Greenlee, Reitman & Sibley, *supra* note 96, at 1145.

128. *Id.*

129. *Id.* at 1148.

130. *Id.* at 1147-48.

Table 1. Bundled Discounts by Firm One

This table shows the equilibrium prices for Firm One and Firm Two under independent pricing and with bundled discounts by Firm One. We assume that all consumers value B. The symbol θ denotes the assumed percentage of the customer population that also values A. Therefore, $1-\theta$ percent of those who buy B would never buy A at any price. Thus, for $\theta = 0.20$, the standalone price for A is 4.55, the bundle price of A is 3.45, etc.

<u>Independent Pricing</u>				<u>Bundling</u>				
θ	P_A	P_1	P_2	θ	P_A	P_{A-B}	P_1	P_2
0.20	3.90	2.29	2.29	0.20	4.55	3.45	2.30	2.27
0.40	3.90	2.29	2.29	0.40	4.44	3.45	2.32	2.25
0.60	3.90	2.29	2.29	0.60	4.38	3.41	2.35	2.24
0.80	3.90	2.29	2.29	0.80	4.34	3.34	2.39	2.22
1.00	3.90	2.29	2.29	1.00	4.30	3.20	2.48	2.21

Table 2. Tied Pricing by Firm One

This table compares independent prices with equilibrium prices under a tying arrangement by Firm One. Again, there is a different set of results for each assumed level of θ . For $\theta = 0.2$, for example, the tied prices of A and B set by Firm One are 3.36 and 2.29, respectively. Firm Two charges 2.26 in the tying equilibrium for $\theta = 0.2$.

<u>Independent Pricing</u>				<u>Tying</u>			
θ	P_A	P_1	P_2	θ	P_A	P_1	P_2
0.20	3.90	2.29	2.29	0.20	3.36	2.29	2.26
0.40	3.90	2.29	2.29	0.40	3.34	2.29	2.23
0.60	3.90	2.29	2.29	0.60	3.31	2.30	2.20
0.80	3.90	2.29	2.29	0.80	3.26	2.32	2.16
1.00	3.90	2.29	2.29	1.00	3.16	2.37	2.13

Table 3. Firm One Profit Effects of Tying and Bundled Discounts

For different values of θ , this table shows the profits earned by Firm One under independent pricing, bundled discounting, and tying. These profit levels result from the equilibrium prices shown in tables 1 and 2.

Note: columns (1) and (2) are taken from GRS, table 3¹³¹

θ	(1) Independent Pricing	(2) Bundled Discounts	(3) Tying
0.00	2.32	—	—
0.20	3.13	3.14	3.06
0.40	3.94	4.02	3.77
0.60	4.74	4.93	4.43
0.80	5.56	5.86	4.95
1.00	6.36	6.90	5.56

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

Note: columns (1) and (2) are taken from GRS, table 3¹³²

This table shows the aggregate levels of consumer welfare (consumer surplus) resulting from the prices shown in tables 1 and 2. These numbers are aggregated over consumers buying at both firms, including those who buy both A and B and those who buy only B.

θ	(1) Independent Pricing	(2) Bundled Discounts	(3) Tying
0.00	30.07	—	—
0.20	30.48	32.57	31.10
0.40	30.88	32.66	32.07
0.60	31.29	32.80	32.94
0.80	31.69	32.92	33.81
1.00	32.10	32.89	34.56

$$\text{Demands: } q_A(P_A) = 24 - 5P_A, q_B(P_B) = 25 - 4P_B$$

$$\text{Marginal Costs: } c_A = 3, c_B = 2$$

131. *Id.* at 1148.

132. *Id.*

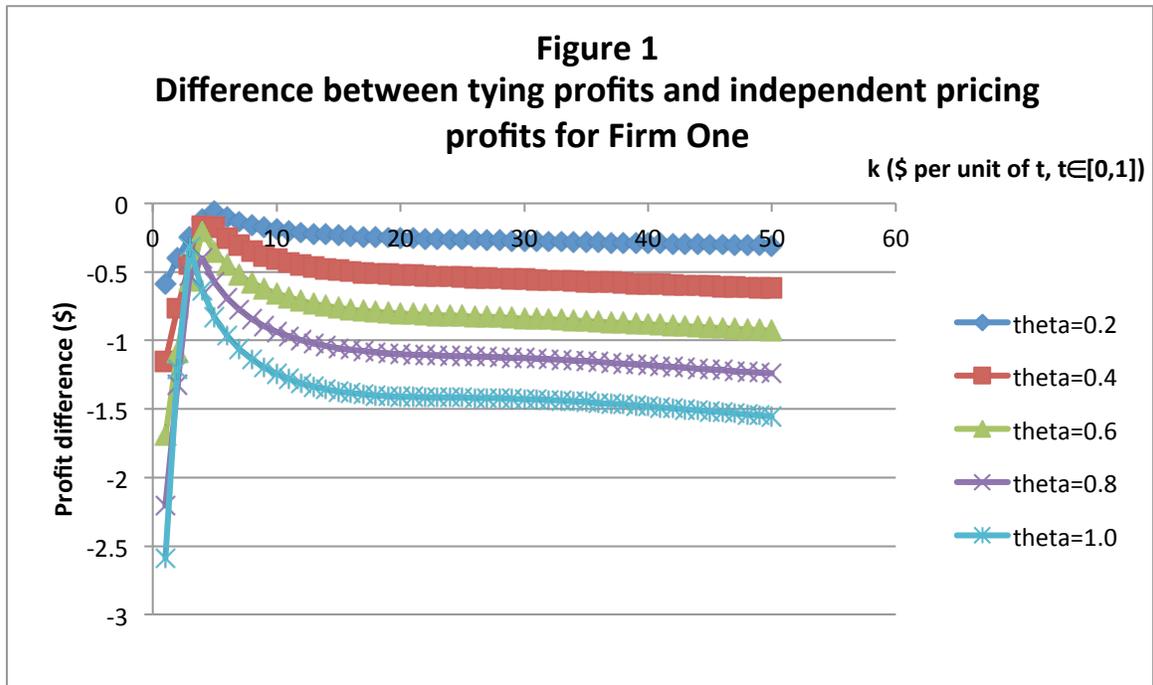
Brand Preference: $k=5$ 

Figure 1 examines whether tying is more profitable than independent pricing for Firm One. It shows the difference between Firm One's tying profits and independent pricing profits. Each curve is for a different value of θ and shows how the profit differential between tying and independent pricing varies with k , the parameter that measures the strength of a consumer's brand preference. The key point to note is that the profit differential is always negative, so that Firm One never does as well under tying as it does with independent pricing.

