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Why Do Firms Bundle and Tie?  
Evidence from Competitive Markets and  
Implications for Tying Law

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# Why Do Firms Bundle and Tie? Evidence from Competitive Markets and Implications for Tying Law

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*Tying the sale of products that could be sold separately is common in competitive markets—from left and right shoes, to the sports and living sections of daily newspapers, to cars and radios. This paper presents a cost-based theory of tying in competitive markets and applies this theory to bundling and tying in pain relievers and cold medicines, foreign electrical plug adapters, and mid-sized automobile sedans. We show that product-specific scale economies are needed to understand tying, yet these scale economies might be hard to detect. We draw two principal conclusions for tying law. First, the theoretical and empirical evidence of tying efficiencies supports abandoning per se treatment of tying. Second, the difficulties in documenting efficiencies, even when they are clearly present, suggests that the rule-of-reason approach to tying should not impose too high a burden on the defendant to prove efficiencies.*

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## Introduction

Tying occurs when a firm sells a particular item (the tying good) only together with some other item (the tied good).<sup>1</sup> In the United States, tying by a firm with market power in the tying good can be a per se violation of the antitrust laws.<sup>2</sup> The law presumes that tying allows a firm to leverage market power from one good to another.<sup>3</sup> But tying is a common practice in markets in which the tying good is competitive (so leverage is not possible) and in which the tied good is competitive (so leverage is not profitable).<sup>4</sup> Thus leveraging cannot be the only economic explanation for tying, nor can we assume that a firm with market power ties in order to leverage rather than for

1 HERBERT HOVENKAMP, FEDERAL ANTITRUST POLICY § 10.4 (1999); RICHARD WHISH, COMPETITION LAW 605-11 (4th ed. 2001).

2 *Jefferson Parish Hosp. v. Hyde*, 466 U.S. 2 (1984). For a recent discussion and application of that standard, see *In re Visa Check/MasterMoney Antitrust Litig.*, No. 96-CV-5238, 2003 U.S. Dist. LEXIS 4965, at \*6 (E.D.N.Y. Apr. 1, 2003). For a review of the case law in Europe, see Christian Ahlborn et al., *The Antitrust Economics of Tying: A Farewell to Per Se Illegality*, 49 ANTITRUST BULL. 287 (2004).

3 *Standard Oil v. United States*, 337 U.S. 293, 305-06 (1949).

4 See CTR. FOR THE NEW EUROPE, *Tying and Bundling: From Economics to Competition Policy*, Edited Transcript of a CNE Market Insights Event, Sept. 19, 2002, [http://www.cne.org/pub\\_pdf/2002\\_09\\_19\\_tying\\_bundling.htm](http://www.cne.org/pub_pdf/2002_09_19_tying_bundling.htm) (last visited Nov. 11, 2004).

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competitive reasons. Tying in competitive markets presumptively occurs because it is efficient—it reduces costs or improves quality. Yet the economics literature focuses exclusively on tying by firms with monopoly power.<sup>5</sup> Moreover, this literature ignores efficiency explanations—often explicitly.<sup>6</sup> Therefore, the current scholarship cannot explain the existence of tying in competitive markets and it cannot provide a complete theory even of tying by firms with significant market power until it considers efficiencies that might arise from tying.<sup>7</sup>

This article takes a necessary but heretofore neglected step toward a positive economic theory of tying. It examines the sources of efficiencies that explain tying in competitive markets. Three case studies provide empirical content for our analysis: cold remedies, foreign electrical adapters, and automobile options. Part I reviews the law on tying in both Europe and the United States and the existing economics literature. Part II presents a new economic model of competitive bundling and tying that we propose as an alternative to those discussed in Part I. Parts III to V present the results of our drug, adapter, and automobile case studies, respectively. Part VI summarizes our findings and discusses their implications for antitrust doctrine. Part VII concludes. The remainder of this introduction summarizes our main findings and describes the organization of this Article.

### *Towards a Positive Theory of Tying*

The Chicago School explanation for tying is the temporal and intellectual benchmark. The pre-Chicago case law claimed that tying was an attempt to leverage a monopoly in one market to another.<sup>8</sup> The Chicago School claimed to debunk the leverage hypothesis with the “single-monopoly-profit theorem.” With one monopoly profit to be had, the monopolist has neither the incentive

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<sup>5</sup> See Dennis W. Carlton & Michael Waldman, *The Strategic Use of Tying To Preserve and Create Market Power in Evolving Industries*, 33 RAND J. ECON. 194 (2002); Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837 (1990).

<sup>6</sup> Neither Whinston nor Carlton and Waldman allow for marginal or fixed cost savings of bundling in their models. See Carlton & Waldman, *supra* note 5; Whinston, *supra* note 5. We do not mean this observation as a criticism of these or related articles, but rather as a caution against drawing improper policy inferences from them. In light of Chicago School arguments that firms do not have incentives to use tying to foreclose, laying out the broad outlines of a theory of anticompetitive tying that is valid despite those arguments is a significant contribution. But assuming away efficiencies to elucidate the logic of foreclosure should not be taken to mean that efficiencies do not exist in real cases.

<sup>7</sup> Here and throughout this article we use the term “monopoly” to refer to firms that have significant market power in that they can raise price substantially above the levels that would prevail in an industry in which firms on average earn only competitive rates of return.

<sup>8</sup> See *Int'l Salt Co. v. United States*, 332 U.S. 392, 396 (1947) (“The tendency of the [tying] arrangement to accomplishment of monopoly seems obvious.”); see also *Standard Oil Co. of Cal. v. United States*, 337 U.S. 293, 305 (1949) (“Tying arrangements serve hardly any purpose beyond suppression of competition.”).

nor the ability to leverage its monopoly into another market.<sup>9</sup> Tying could, however, be used for price discrimination,<sup>10</sup> which does not generally reduce aggregate social welfare.<sup>11</sup> The post-Chicago literature has identified circumstances in which the single-monopoly-profit theorem does not hold and in which tying could be used to profitably foreclose competition, thereby reducing social welfare.<sup>12</sup>

Today, price discrimination and foreclosure of competition are the two leading explanations for tying. But they can only explain tying by firms that have market power. Economists recognize that tying can result in cost savings for producers and consumers as well as improvements in product quality. However, this efficiency explanation is often assumed away in theoretical models in order to focus on other explanations.<sup>13</sup>

Yet casual empiricism suggests that efficiencies must be the major explanation for tying: tying is common in competitive markets<sup>14</sup> and therefore cannot result mainly from foreclosure or from price discrimination. Just to name a few, the following competitive markets tie one product to another: airlines (passenger seat and baggage transport), apartments (appliances and mailboxes are included with the rooms); cigarettes (the filter and the tobacco are combined for most brands); encyclopedias (you must purchase the entire set of volumes); dental services (anesthesia and cavity repair are only sold together); newspapers (the sports section cannot be purchased separately from the front page);

9 ROBERT H. BORK, THE ANTITRUST PARADOX 373-81 (1978); Aaron Director & Edward H. Levi, *Law and the Future: Trade Regulation*, 51 NW. U. L. REV. 281 (1956).

10 JEAN TIROLE, THE THEORY OF INDUSTRIAL ORGANIZATION 193-94, 333-35 (1988).

11 See Hal R. Varian, *Price Discrimination*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 597 (Richard Schmalensee & Robert D. Willig, eds., 1989); see also Benjamin Klein & John Shepard Wiley, Jr., *Competitive Price Discrimination as an Antitrust Justification for Intellectual Property Refusals To Deal*, 70 ANTITRUST L.J. 599 (2003).

12 See Whinston, *supra* note 5. In some theoretical models in the recent literature, "foreclosure" of the market for the tied good is used to protect monopoly power in the market for the tying good, not to leverage one monopoly into a second. In these models, tying involves foreclosure but not leverage. Carlton & Waldman, *supra* note 5, at 195. For simplicity, this paper uses the term "foreclosure" to refer to either type of effect.

13 A recent report on bundling and tying by Barry Nalebuff, a leading contributor to the literature, is but one example of how economists put efficiency explanations to one side. (Tying is a special case of bundling, as we discuss below.) After presenting a "complete list" for why firms bundle, he notes: "Perhaps the most obvious reason to bundle two products is that this leads to a cost saving or quality improvement or both." He elaborates on efficiencies for nearly three pages, part of which considers and ultimately rejects the possibility that efficiencies are harmful. He then devotes nearly thirty pages explaining ten additional reasons for bundling and tying that are not related to efficiencies. BARRY NALEBUFF, BUNDLING, TYING, AND PORTFOLIO EFFECTS: PART 1, CONCEPTUAL ISSUES, at 31 (U.K. Dep't of Trade & Indus., DTI Economics Paper No. 1, Feb. 2003); Barry Nalebuff, *Bundling as a Barrier to Entry*, 119 Q.J. ECON. 159 (2004).

14 We use the phrase "competitive markets" to refer to ones in which firms do not persistently earn above-normal rates of return, either because of multiple firms in the market or because of the threat of entry. Firms in competitive markets can thus have some limited degree of short-run market power. Our cost-based theory of competitive tying incorporates this notion of competition by assuming that markets are contestable in the sense that the threat of entry prevents prices from significantly exceeding average costs. See *infra* Part II for more details.

restaurant service (water and bread frequently appear automatically, regardless of what you order); shoes (left and right shoes are not sold separately, and shoe laces are included as well).

Beyond the observation that bundling can create efficiencies, the economics literature has little more to say, either empirically or theoretically. That is all the more problematic because, as we will show, the efficiency explanations are not as simple as they might first appear. Economics therefore does not have a complete positive theory that explains why we observe tying in markets with any degree of competition.

This deficiency in the economics literature has practical importance for antitrust law. Ever since the Supreme Court's *Jefferson Parish* decision, courts have recognized the importance of distinguishing between anti-competitive explanations for tying and efficiency explanations.<sup>15</sup> We discuss this further below. For now, we observe that economics has not provided the courts with much help. Foreclosure theories show that tying could be anticompetitive under special conditions that are difficult and perhaps impossible to verify in practice.<sup>16</sup> And the literature provides scant guidance on the efficiency side—the main focus of this paper.

#### *Efficiencies and Tying in Competitive Markets*

Bundling—offering two or more products at a single price—can provide efficiencies such as marginal cost savings, quality improvements, and customer convenience. Bundling enables producers to offer the bundle more cheaply or to provide more value to consumers who want both products.<sup>17</sup> But even with these efficiencies, we would also expect firms to offer the products separately to those customers who value one product at less than the marginal cost of adding it to the bundle. And in fact many firms do just this, offering the bundle as well as the components.

Tying is a special case of bundling in which consumers do not have the choice of buying the “tied” product without the “tying” product.<sup>18</sup> Many firms in competitive markets practice tying as well. We present a theory of cost-based bundling, showing that firms in competitive markets *may* find it efficient to tie when they can economize on the fixed cost of product offerings or when they

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15 *Jefferson Parish Hosp. v. Hyde*, 466 U.S. 2 (1984); see also *Eurofix-Bauco v. Hilti*, Commission Decision 88/138/EEC, 1988 O.J. (L 065) 19.

16 See Ahlborn et al., *supra* note 2; see also Keith N. Hylton & Michael Salinger, *Tying Law and Policy: A Decision-Theoretic Approach*, 69 ANTITRUST L.J. 469 (2001).

17 This article focuses on the case in which the bundle includes discrete products that could be sold separately. However, similar considerations apply to the situation in which firms make choices on integrating product attributes together rather than creating separable components.

18 In the economics literature, the term “mixed bundling” means offering the goods separately and in combination with a discount for the combination. “Pure bundling” means offering the goods only as a package. Pure bundling is a form of tying, as is selling the package and just some of the components.

can realize product-specific scale economies. And of course if firms in competitive markets can tie for efficiency reasons, so can firms with significant market power.

Fixed cost savings from bundling have two implications. First, it may not be efficient to provide one of the products separately even though some consumers might prefer it. Enough customers must want both of the separate items to justify the additional fixed costs. That is why it is not possible to buy left shoes alone even though some people might want to do so—those perhaps with no right leg or with a dog who has eaten their left shoe. Second, and more subtly, tying increases demand for the tied item and thereby allows the seller to achieve greater scale on it than if the seller offered the items separately.<sup>19</sup>

Three facts established in this paper have important implications for tying doctrine: tying occurs in competitive markets; product-specific scale economies are needed to understand tying; and product-specific scale economies may be hard to detect even when they are present. From these points, we draw two principal conclusions.

First, per se condemnation of tying in its various manifestations is wrong as a matter of economics.<sup>20</sup> Neither the *Jefferson Parish* test in the United States nor the *Hilti/Tetra Pak II* approach in the European Union is capable of distinguishing anti-competitive from pro-competitive tying.<sup>21</sup>

Second, because it is hard to prove efficiencies even when practices could not arise for anticompetitive reasons, it might also be hard to prove efficiencies required even by a rule of reason, much less whatever limited efficiency defense is allowed under the current per se rule. Both approaches will therefore result in the frequent condemnation of efficient tying—a high rate of false convictions—if the tying firm has to bear a substantial burden of proof of showing efficiencies as it does under current approaches.<sup>22</sup>

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19 Effects similar to this can arise from network effects even if product-specific scale economies do not exist. For example, suppose that network effects exist for the tying good but are affected by the presence of the tied good. That is, the tying good alone might be thought to constitute one network, and the bundle of the tying and tied goods to constitute another network. A vendor could conclude that while some customers would prefer to purchase the goods separately, the resulting lost network effects for other customers reduce the overall value of the system to customers as a whole. David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. ON REG. 325, 370 (2003). See also Jean-Charles Rochet & Jean Tirole, *Tying in Two-Sided Markets and the Impact of the Honor All Cards Rule* (2003) (working paper, on file with authors), for an application of this to the honor-all-cards rule that was the subject of the Wal-Mart litigation mentioned above.

20 We are not aware of any articles in a mainstream economics journal or by an economist in a law review that finds that the *Jefferson Parish* rule could distinguish pro-competitive from anti-competitive tying. See Ahlborn et al., *supra* note 2; Evans et al., *A Pragmatic Approach to Identifying and Analyzing Legitimate Tying Cases*, in EUROPEAN COMPETITION LAW ANNUAL 2003: WHAT IS AN ABUSE OF A DOMINANT POSITION? (forthcoming November 2005); Hylton & Salinger, *supra* note 16.

21 For a discussion of the EU approach, see Ahlborn et al., *supra* note 2.

22 As we have pointed out elsewhere, Professor Nalebuff's results support this. He reevaluates several leading tying cases in the United States and Europe. His results show a high rate of error under his evaluation. See NALEBUFF, *supra* note 13. For further discussion of the error-cost issue, see Evans et al., *supra* note 20.

*Organization and Overview*

In Part I we elaborate on the development of the legal doctrine on tying, the development of the economics literature on bundling and tying, and the relationship between the two. Our legal discussion focuses on *Jefferson Parish*, which, we argue, rejects a plausible efficiency justification for the tie at issue. We then argue that while the legal doctrine is flawed, the economics literature has not provided a helpful framework for evaluating tying either. We describe the two main strands of the literature: price discrimination and strategic foreclosure.

In Part II we show how efficiencies can give rise to tying in competitive markets (and therefore in monopoly markets as well). When there are product-specific fixed costs, tying can arise under competition even if a significant group of customers wants just one component of a bundled product. Tying can arise when bundling provides great savings or convenience, and the fixed costs of offering a component of the bundle separately are large relative to the demand for the separate component. It can also arise when there are moderate fixed cost savings but low demand for a separate component. Although the model we present is simple, it provides general insights and helps motivate the three case studies to which we then turn.

Part III examines cold remedies in which several different active ingredients are combined into a single product. The efficiencies from bundling appear to be substantial, so the bundled product serves the needs of some customers much better than would buying the component products separately. In this case, the efficiencies do not always give rise to tying—separate products are also offered by some sellers. But the same cost structures in a market with greater scale economies or less demand could result in tying.

Part IV considers a group of four electrical adapters sold only as a package by RadioShack—not all the products are offered separately, so the package is a tie. We argue that the tie occurs because the package appeals to several different sets of customers while conserving on the fixed costs of stocking different adapters as well as on packaging costs.

The third case is the tying of optional equipment on automobiles, considered in Part V. We consider three competing mid-sized sedans over the period 1986-2004. At the beginning of the period, Ford did not tie the options it made available on the Taurus. In contrast, Toyota and Honda did tie options to a much greater extent on the Camry and the Accord. Over time, Ford's strategy came to resemble that of Toyota and Honda. We link this trend toward tying under competition to the accounting and management science literature on the cost of product complexity. Offering fewer product variants reduces costs in ways that are real and substantial but hard to document.

Part VI considers the implications of these cases and our general analysis for tying law. In each of three case studies we show that cost savings is the



most plausible explanation for the practice. If the markets in which these products are sold were not competitive, we would not so quickly reject price discrimination or foreclosure as alternative explanations. Moreover, the most easily documented efficiencies are those from bundling (our pharmaceutical case provides an example). The efficiencies that give rise to tying, such as those that we document in the automobile case, are subtler and might be harder to document. Since those efficiencies would be at the heart of any efficiency defense in a tying case, there is a risk that the finder of fact, who focuses only on the case at hand and ignores the fact that tying is common in competitive markets and is presumptively efficient, will not be able to correctly explain the tying practice. A rational legal doctrine must acknowledge the difficulty of understanding any particular business practice and the risks and costs of judicial error.<sup>23</sup> That risk will depend partly on who bears the burden of proof and how high that burden is. We conclude that the antitrust analysis of tying should be based on the rule of reason and, importantly, that once a defendant has put forward a plausible efficiency defense for the practice the plaintiff should bear the burden of showing that the defense is pretextual.<sup>24</sup>

#### I. Tying: The Law and the Economics Literature

Tying is an anomaly in United States antitrust doctrine. It is per se illegal even though it more nearly resembles the sorts of practices that are judged under a rule of reason.<sup>25</sup> It is the only significant area of antitrust law in which the courts have not adopted an economic approach in the last quarter century.<sup>26</sup> To be sure, the per se ban on tying is different from the ban on price fixing because certain other conditions must be present to trigger the per se treatment. Still, it would not be accurate to characterize the nominal per se standard as being functionally the same as a rule of reason. When a restraint could be

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<sup>23</sup> For the classic treatment, see Frank H. Easterbrook, *The Limits of Antitrust*, 63 TEX. L. REV. 1 (1984). See also David S. Evans & A. Jorge Padilla, *Designing Antitrust Rules for Assessing Unilateral Practices: A Neo-Chicago Approach*, 72 U. CHI. L. REV. (forthcoming Winter 2005).

<sup>24</sup> This approach is therefore more consistent with the approach endorsed by the D.C. Circuit in its evaluation of the alleged tie of Microsoft Windows and Internet Explorer under the consent decree entered into by Microsoft and the U.S. Department of Justice, *United States v. Microsoft Corp.*, 147 F.3d 935 (D.C. Cir. 1998) [hereinafter *Microsoft II*], which considered the consent decree entered into in *United States v. Microsoft Corp.*, 56 F.3d 1448 (D.C. Cir. 1995) [hereinafter *Microsoft I*], than with the Court's evaluation of the alleged tie under the Sherman Act case brought by the Justice Department and several states, *United States v. Microsoft Corp.*, 253 F.3d 34 (D.C. Cir. 2001) [hereinafter *Microsoft III*].

<sup>25</sup> It resembles a practice usually considered under the rule of reason because there is no strong presumption in economics that tying will harm consumers, and it provides efficiencies unlike all other practices covered under the usual per se standard.

<sup>26</sup> See, e.g., Todd J. Anlauf, *Severing Ties with the Strained Per Se Test for Antitrust Tying Liability: The Economic and Legal Rationale for A Rule of Reason*, 23 HAMLINE L. REV. 476, 478-79 (2000) ("The current per se test has been strained to accommodate some economic analysis and even limited affirmative defenses, but the analysis falls short of the full balancing necessary to determine the economic effects of tying arrangements. Thus, a rule of reason approach used for several other areas of antitrust law should be adopted to evaluate tying arrangements.").

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characterized in a number of different ways, such as a predatory or exclusionary practice in violation of section 2 of the Sherman Act (and evaluated under the rule of reason), or tying (as a contract in restraint of trade) under section 1 of the Sherman Act or section 3 of the Clayton Act, plaintiffs in our experience usually opt for tying.<sup>27</sup> Although the rule-of-reason approach in *Microsoft III*<sup>28</sup> has been cited by the courts,<sup>29</sup> they remain reluctant to depart from *Jefferson Parish*. This reluctance appeared most recently in the federal district court's summary judgment decision in *In re Visa CheckCard/MasterMoney Antitrust Litigation*.<sup>30</sup> The court applied a per se test and found on summary judgment that the main elements of that test had been met.<sup>31</sup> It allowed the possibility that liability required evidence of an anticompetitive effect in the tied market, and left this for a jury trial. MasterCard and Visa quickly agreed to a settlement.<sup>32</sup>

The European Commission recently found that Microsoft abused a dominant position in violation of Article 82 of the EC Treaty by not offering computer manufacturers and end users the choice of obtaining Windows without certain media player technologies.<sup>33</sup> Although the Commission indicated that it used a rule-of-reason approach,<sup>34</sup> the decision relied on a test similar to the modified per se test employed in the United States.<sup>35</sup>

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27 See Sherman Antitrust Act §§ 1-2, 15 U.S.C. §§ 1-2 (2004); Clayton Act § 3, 15 U.S.C. § 14 (2004).

28 253 F.3d 34.

29 See, e.g., *CCBN.com, Inc. v. Thomson Fin., Inc.*, 270 F. Supp. 2d 146, 156 (D. Mass. 2003); *Indep. Ink, Inc. v. Trident, Inc.*, 210 F. Supp. 2d 1155, 1162 (C.D. Cal. 2002).

30 No. 96-CV-5238, 2003 U.S. Dist. LEXIS 4965, at \*6 (E.D.N.Y. Apr. 1, 2003).

31 See *infra* Section I.A for a description of the per se test's four conditions.

32 Howard H. Chang et al., *The Retailer Class Action Antitrust Case Against the Card Associations*, 2 PAYMENT CARD ECON. REV. 123, 139-40 (2004).

33 Case COMP/C-3/37.792-Microsoft, Commission Decision (March 24, 2004).

34 As a top EU antitrust official stated,

I would like to stress that the Commission has not ruled that tying is illegal per se, but rather developed a detailed analysis of the actual impact of Microsoft's behavior, and of the efficiencies that Microsoft alleges. In other words we did what the US Court of Appeals suggested be done: we used the rule of reason although we don't call it like that in Europe.

Press Release, Delegation of the European Commission to the United States, Microsoft: Statement by E.U. Commissioner Mario Monti (Mar. 24, 2004), <http://www.eurunion.org/news/press/2004/20040047.htm>. See also Maurits Dolmans & Thomas Graf, *Analysis of Tying Under Article 82 EC: The European Commission's Microsoft Decision in Perspective*, 27 WORLD COMPETITION 225 (2004); David S. Evans & A. Jorge Padilla, *Tying Under Article 82 EC and the Microsoft Decision: A Comment on Dolmans and Graf*, 27 WORLD COMPETITION 503 (2004).

35 As the Commission explained,

Tying prohibited under Article 82 of the Treaty requires the presence of the following elements: (i) the tying and tied goods are two separate products; (ii) the undertaking concerned is dominant in the tying product market; (iii) the undertaking concerned does not give customers a choice to obtain the tying product without the tied product; and (iv) tying forecloses competition.

Microsoft Commission Decision, *supra* note 33, at ¶ 794.

A. *The Law*<sup>36</sup>

The Supreme Court last considered the law of tying in *Jefferson Parish*.<sup>37</sup> East Jefferson Hospital, in Jefferson Parish, Louisiana, had an exclusive contract with an anesthesiology practice to provide anesthesiology services to the hospital's surgery patients. Edwin Hyde, an anesthesiologist, claimed this was an illegal tie. The Court found unanimously that the arrangement in this case was legal, but it was sharply divided over why. In a concurring opinion joined by three other Justices, Justice O'Connor argued for ending the per se ban on tying. She conceded that the per se rule was never quite as draconian as it appeared, but she claimed nonetheless that defendants should be able to offer an explicit efficiency defense under the rule of reason. In contrast, the majority voted to retain the per se rule. Writing for the majority, Justice Stevens wrote, "[i]t is far too late in the history of our antitrust jurisprudence to question the proposition that certain tying arrangements pose an unacceptable risk of stifling competition and therefore are unreasonable 'per se.'"<sup>38</sup> This quote suggests that the majority might not choose per se treatment if it could start over. As a result, one might suspect that the Court would try to reframe the necessary conditions for the per se rule to create, for all practical purposes, a rule of reason.

The *Jefferson Parish* test finds a per se violation when the following four conditions are satisfied: first, there must be two products; second, the two products must be tied; third, the seller must have market power in the tying product; fourth, a not insubstantial volume of commerce must be affected.<sup>39</sup> A fifth condition, that there must be an anticompetitive effect in the market for the tied good, has been applied to different extents by the circuit courts, although not without controversy.<sup>40</sup>

This four-condition test enables the courts to consider efficiencies indirectly and therefore incorporates elements of a rule-of-reason analysis. In

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36 We focus here on the aspects of the tying law that are relevant for our discussion later. For detailed surveys of the tying cases, see Hylton & Salinger, *supra* note 16, and Ahlborn et al., *supra* note 2. For a detailed discussion of *Jefferson Parish*, see William J. Lynk, *Tying and Exclusive Dealing: Jefferson Parish Hospital v. Hyde* (1984), in *THE ANTITRUST REVOLUTION* 342 (John E. Kwoka & Lawrence J. White eds., 3d ed. 1999).

37 *Jefferson Parish Hosp. v. Hyde*, 466 U.S. 2 (1984). Other Supreme Court tying cases include: *United States Steel Corp. v. Fortner Enter., Inc.*, 429 U.S. 610 (1977); *White Motor Co. v. United States*, 372 U.S. 253 (1963); *United States v. Loew's Inc.*, 371 U.S. 38 (1962); *N. Pac. Ry. Co. v. United States*, 356 U.S. 1 (1958); *Times-Picayune Publ'g Co. v. United States*, 345 U.S. 594 (1953); *United States v. Paramount Pictures, Inc.*, 334 U.S. 131 (1948); and *Int'l Salt Co. v. United States*, 332 U.S. 392 (1947).

38 *Jefferson Parish*, 466 U.S. at 9. The Supreme Court has been willing to alter other aspects of antitrust doctrine. A prime example is the *Matsushita* decision, which substantially raised the standard for establishing a predatory pricing claim. *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986).

39 See PHILLIP E. AREEDA, 9 ANTITRUST LAW ¶ 1702 (1991).

40 *Id.*

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evaluating whether anesthesiology and surgery are separate products, the Court ruled that “[i]n this case, no tying arrangement can exist unless there is sufficient demand for the purchase of anesthesiology services separate from hospital services to identify a distinct product market in which it is efficient to offer anesthesiological services separately from hospital services.”<sup>41</sup> However, the history of the case should give one pause that the separate product test allows for a serious consideration of efficiencies. The district court found significant efficiencies, the Fifth Circuit dismissed them, and the Supreme Court relied on the market power screen to find for the hospital.<sup>42</sup>

East Jefferson Hospital had thirteen operating rooms. Nurse anesthetists provided the anesthesiology in most cases. The anesthesiologists in the group with the exclusive deal provided supervision. One might interpret this form of organization as being efficient. The district court thought so:

The evidence presented was that defendants instituted a closed system anesthesiology department because they believed the system resulted in the best quality of patient care. Specifically the system insures twenty-four hour anesthesiology coverage, aids in the control and standardization of . . . operations because it is not necessary to accommodate physicians with outside commitments; it permits the physicians, nurses, and other technicians in the department to develop a work routine and a proficiency with the equipment they use in patient treatment; and it increases the Board's ability to monitor the medical standards exercised because there are fewer individuals involved, maintenance of equipment is simplified and equipment breakdowns are minimized by limiting use to one group of physicians.<sup>43</sup>

This efficiency explanation strikes us as persuasive, although the posited cost savings may be difficult to document, much less quantify.

The head of the anesthesiology practice at East Jefferson Hospital testified that his group would have provided twenty-four hour coverage without a contractual requirement to do so. That was, apparently, enough for the Fifth Circuit to conclude that the provision of continuous coverage, one basis of the claimed efficiencies, could be “rebutted quite easily.”<sup>44</sup> But it is not hard to see that the hospital might have reasonably preferred an enforceable contract rather than the good word of this or any other anesthesiologist—and that this might have benefited its patients. Part of the problem here is the burden of proof, to which we will return later: tying efficiencies may be hard to document, and a defendant may have a difficult time proving them well enough to satisfy a court that is predisposed against tying.

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41 *Jefferson Parish*, 466 U.S. at 21-22.

42 We do not in this paper address the distinction between the legal standards toward tying and toward product integration. The courts have historically been reluctant to treat product integration as tying, and the law is therefore substantially less hostile to technological integration than to tying. See Hylton & Salinger, *supra* note 16. Because the distinction between technological integration and contractual tying is often not clear, however, this has emerged as a key issue in computer software. See, e.g., *Microsoft II*, 147 F.3d 935 (D.C. Cir. 1998). In our framework, technological integration can be a source of bundling economies and could be treated as part of a unified doctrine that covers both contractual tying and product integration.

43 *Hyde v. Jefferson Parish Hosp.*, 513 F. Supp. 532, 540 (E.D. La. 1981), *rev'd*, 686 F.2d 286 (5th Cir. 1982), *rev'd*, 466 U.S. 2 (1984).

44 686 F.2d at 288 n.2, *rev'd*, 466 U.S. 2 (1984).

The Supreme Court agreed that anesthesiology and hospital services were distinct products—and that it was efficient to provide them separately.<sup>45</sup> So it rejected the cost savings found by the district court and sided with the Fifth Circuit. But it found that the hospital lacked significant market power, so the arrangement could not have anticompetitive effects.<sup>46</sup> This analysis raises some troublesome questions. As we will see in the next Section, even if the hospital had market power, it is not obvious how it could profit by tying anesthesiology services to hospital services. And given that the hospital did not have market power, according to the Supreme Court, it could not have engaged in a profitable anticompetitive strategy.<sup>47</sup> So under the Court's view, the hospital must have engaged in the practice in error. Perhaps the strategy was efficient after all.

### B. *The Economics Literature*

The formal economics literature on tying has gone through two distinct stages over the last thirty-five years. The first was the price discrimination strand started by Stigler,<sup>48</sup> who offered the explanation as an alternative to the leveraging theory adopted by the courts. Then, starting in the early 1990s, the literature has revived the foreclosure theory, intuited by the courts, by providing it with rigorous game-theoretic foundations that can apply in specific circumstances.

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45 466 U.S. at 21-23.

46 *Id.* at 27.

47 *Id.* at 27-28.

48 George J. Stigler, *A Note on Block Booking*, in *THE ORGANIZATION OF INDUSTRY* 165 (1968). Bundling is of economic interest only if the bundle price is different from the sum of the components prices. There is price discrimination if these differences are not the result of cost differences (i.e. efficiencies). Although foreclosure strategies could also lead to price differences we treat those separately and therefore reserve the term price discrimination for those cases where the motive for the bundling is based neither on efficiency nor foreclosure reasons. The price-discrimination models we consider assume that the seller is a monopolist and evaluate whether bundling yields higher profits than simple monopoly pricing (i.e., a constant price per unit that does not depend on the purchase of another good). Simple monopoly pricing leaves consumers with some surplus (because some consumers are willing to pay more than the monopoly price) and leaves other consumers without the product even though they are willing to pay more than the marginal cost of production (but they do not buy because they value the good at less than the monopoly price). This consumer surplus that is lost from not supplying this second group is known as "deadweight loss." Bundling by a monopolist can be profitable if it allows the firm to capture either extra surplus from consumers who are willing to pay more than the monopoly price or to make additional sales to consumers who are not willing to pay more than the monopoly price.

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### 1. The Price Discrimination Strand

There are two price discrimination explanations for bundling.<sup>49</sup> The first, from Stigler, is that tying enables firms to extract more consumer surplus from consumers who place different valuations on the separate goods.<sup>50</sup> The second explanation, due to Bowman, is that tying a consumable product to a durable product may help firms charge more for consumers with greater demand for the durable good.<sup>51</sup>

Stigler's seminal piece concerned block booking of films in the case of *United States v. Loew's, Inc.*<sup>52</sup> The issue in the case was the requirement that movie theaters take a distributor's Grade B movies along with its Grade A movies. The allegation in the case, typical in tying cases, was that the practice was a way of leveraging market power from Grade A to Grade B movies. Stigler challenged this interpretation and provided a simple alternative explanation based on a numerical example.

A slightly modified version of his example goes as follows. Suppose there are two goods (*A* and *B*) and two customers (*I* and *II*). Customer *I* is willing to pay 10 for *A* and 4 for *B*. Customer *II* is willing to pay 4 for *A* and 11 for *B*. The marginal cost of both goods is 0. Without bundling, the prices for goods *A* and *B* are 10 and 11, respectively. Customer *I* buys *A* but not *B*, customer *II* buys *B* but not *A*, and consumer surplus is 0. With bundling, the seller charges 14 for the bundle. Both consumers buy the bundle (and, therefore, both components). Customer *II* gets a surplus of 1. The seller's profits go up from 21 to 28.<sup>53</sup> This simple example contains an explanation for why bundling may be beneficial for consumers in some cases. Customers who desire the entire bundle (as both customers do in our modified example) pay a lower price than they would if the seller had to sell the components separately. When bundling increases consumer surplus, it does so because the gains to the group that

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49 Both effects were discussed by Director & Levi, *supra* note 9, at 289-92, and expanded on by Stigler, *supra* note 48, and Ward S. Bowman, Jr., *Tying Arrangements and the Leverage Problem*, 67 *YALE L.J.* 19 (1957).

50 Several articles over the years have explored this basic explanation at greater levels of generality. See William James Adams & Janet L. Yellen, *Commodity Bundling and the Burden of Monopoly*, 90 *Q.J. ECON.* 475 (1976); Yannis Bakos & Eric Brynjolfsson, *Bundling Information Goods: Pricing, Profits, and Efficiency*, 45 *MGMT. SCI.* 1613 (1999); R. Preston McAfee et al., *Multiproduct Monopoly, Commodity Bundling, and Correlation of Values*, 104 *Q.J. ECON.* 371 (May 1989); Richard L. Schmalensee, *Gaussian Demand and Commodity Bundling*, 57 *J. BUS.* 211 (1984).

51 Bowman, *supra* note 49.

52 Stigler, *supra* note 48.

53 In Stigler's example, one customer would pay \$8,000 for film *X* and \$2,500 for film *Y*. The other customer would pay \$7,000 for film *X* and \$3,000 for *Y*. This choice of numbers more nearly matches Grade A and Grade B movies, but it is not as effective for illustrating why consumers might welcome bundling by a multiproduct firm.

wants both components exceed the costs to people who want just one component and are forced to buy the bundle instead.<sup>54</sup>

Stigler's explanation relies on heterogeneous consumers. It may help explain why bundling is especially relevant to the growing information goods portion of the economy. Many of these goods have negligible marginal costs. Bakos and Brynjolfsson show that when marginal costs are low or zero, bundling goods together increases demand for a product without increasing costs.<sup>55</sup> This might well explain the bundling of diverse networks into basic cable television service<sup>56</sup> and the bundling of various types of content (e.g., the news, sports, and style) in a single newspaper.<sup>57</sup> The fixed costs savings that we discuss below reinforce these incentives.

Tying has also been explained by the literature as a metering device.<sup>58</sup> The classic example is IBM tying its punch cards to its card-punching machines.<sup>59</sup> By requiring its customers to use IBM punch cards and charging supra-competitive prices for them, IBM could elicit higher total margins from customers that used its machines intensively than from those who used its machines less. This motive would seem to be present in a wide variety of circumstances in which a company sells an apparatus that requires supplies that vary with usage. Examples include copy machines and copies<sup>60</sup> as well as cameras and film processing.<sup>61</sup>

## 2. The Foreclosure Literature

The next stage of development in the tying literature returned to the possibility that firms tie products to preserve or extend market power, the original foundation for the legal concern with tying. Arguing that a monopolist could extract its profits only once and that there was no obvious reason to do so by tying, the Chicago School challenged the logic of the leverage. It is now understood that the single-monopoly-profit theorem rests on strong

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54 In this example, offering the bundle rather than the components does not make any customer worse off. Thus, the example only illustrates the potential gain from bundling, not the potential cost.

55 Bakos & Brynjolfsson, *supra* note 50.

56 Michael A. Salinger, *A Graphical Analysis of Bundling*, 68 J. BUS. 85, 97 (1995).

57 Bakos & Brynjolfsson, *supra* note 50.

58 For an initial economic discussion, see M.L. Burstein, *The Economics of Tie-In Sales*, 42 REV. ECON. & STAT. 68 (1960). For explicit modeling see Walter Y. Oi, *A Disneyland Dilemma: Two-Part Tariffs for a Mickey Mouse Monopoly*, 85 Q.J. ECON 77 (1971), and L.G. Telser, *A Theory of Monopoly of Complementary Goods*, 52 J. BUS. 211 (1979). Also see Bowman, *supra* note 49, for a discussion of the legal implications.

59 *Int'l Bus. Mach. Corp. v. United States*, 298 U.S. 131 (1936).

60 *SCM Corp. v. Xerox Corp.*, 645 F.2d 1195 (2d Cir. 1981).

61 When issues like this arise, there is typically a claimed efficiency. IBM argued that its machines would only work properly if used with its punch cards. A prominent set of cases in Europe concerned Tetra Pak, which sells packaging systems for milk and other consumable liquids. Tetra Pak II, Commission Decision 92/163/EEC, 1992 O.J. (L 072) 1; Case T-83/91, *Tetra Pak Int'l S.A. v. Commission*, 1994 E.C.R. II-755.

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assumptions. Aghion and Bolton's analysis of long-term contracts, which can be thought of as tying sales in different periods, provided the basic insight of this literature.<sup>62</sup> Whinston was the first to present a formal model of how contemporaneous tying can be a profitable strategy to deter entry.<sup>63</sup> Carlton and Waldman, Nalebuff, and Choi and Stefanadis provide notable recent extensions.<sup>64</sup>

As these models are complicated, a complete exposition of them is beyond the scope of this article.<sup>65</sup> Still, it is important to be clear about both the nature and the limitations of the contributions these articles make. The models demonstrate the theoretical possibility of tying to foreclose entry. They thereby provide a necessary correction to the Chicago view (among some adherents) that profitable foreclosure is never possible. The new models rest, however, on very restrictive assumptions. One is that bundling generates no efficiencies. Without allowing for possible efficiencies, the models cannot weigh the offsetting welfare effects of efficiency and foreclosure. Moreover, even if one were to incorporate efficiencies into the models, the remaining assumptions are so stylized that it is hard to know when they apply—if ever.<sup>66</sup> As it currently stands, the literature represents a significant scholarly contribution which, with further work, might yield useful policy insights. The existing literature by itself, though, does not give the antitrust authorities or the courts much practical guidance on how to determine whether a particular tie harms consumer welfare.<sup>67</sup>

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62 Philippe Aghion & Patrick Bolton, *Contracts as a Barrier to Entry*, 77 AM. ECON. REV. 388 (1987).

63 Whinston, *supra* note 5.

64 Carlton & Waldman, *supra* note 5; see also Jay Pil Choi & Christodoulos Stefanadis, *Tying, Investment, and the Dynamic Leverage Theory*, 32 RAND J. ECON. 52 (2001); Nalebuff, *supra* note 13.

65 Hylton & Salinger, *supra* note 16, uses numerical examples to expost the essential features of the models.

66 Ahlborn et al., *supra* note 2, at 335-36.

67 The authors of these articles agree with this point. Whinston was quite careful not to draw strong policy implications from his model.

While the analysis vindicates the leverage hypothesis on a positive level, its normative implications are less clear. Even in the simple models considered here, which ignore a number of other possible motivations for the practice, the impact of this exclusion on welfare is uncertain. . . . [T]he difficulty of sorting out the leverage-based instances of tying from other cases, makes the specification of a practical legal standard extremely difficult.

Whinston, *supra* note 5, at 855-56. Carlton and Waldman state, "we would like to caution that trying to turn the theoretical possibility for harm shown here into a prescriptive theory of antitrust enforcement is a difficult task." Carlton & Waldman, *supra* note 5, at 215. See also Michael D. Whinston, *Exclusivity and Tying in U.S. v. Microsoft: What We Know, and Don't Know*, 15 J. ECON. PERSP. 63, 79 (2001):

What is striking about the area of exclusive contracts and tying, however, is how little the current literature tells us about what these effects are likely to be. This state of (non) knowledge is, I think, responsible to a significant degree for the very strong but differing beliefs that economists often have about whether exclusive contracts and tying are likely to have welfare-reducing anticompetitive effects.



## II. The Role of Costs in Tying

Although there has been essentially no empirical research into efficiencies from bundling and tying products together, it is not hard to imagine where efficiencies might come from. Many products have packaging and distribution costs. Using the same packaging and distribution for multiple products can reduce marginal costs, especially for products whose marginal costs of production are low relative to the marginal costs of packaging and distribution. Reducing product varieties may also reduce costs by eliminating the need for shelf space and the administrative and transaction costs associated with having multiple product lines. Consumers may realize lower transaction costs or greater convenience when they can buy multiple products they want together.

This Part develops a model that provides insights into how the costs of offering multiple product combinations, together with the existence of consumers who place differing values on these combinations, might give rise to tying. Section A describes the model and its principal results. Section B describes the formal assumptions and uses numerical examples to show how variations in costs and demand can lead to different product configurations, including ones that correspond to tying.<sup>68</sup> Section C summarizes the insights from the cost-based theory.

### A. Overview of a Cost-Based Model of Bundling and Tying

Consider the case of several products that can be sold either separately or together. Consumers get the greatest product choice when they can buy the products either separately or combined. Tying results in a limitation on product variety—consumers do not have the choice of buying the tied product separately from the other products with which it is bundled. That reduction in product choice may be socially efficient if it makes consumers as a group better off by lowering prices for the combinations that are offered, or if there is not sufficient demand to offer the tied product on a stand-alone basis. In this Section we explore the role of costs in explaining why firms in competitive markets eliminate product choices.

Before we discuss our approach it is useful to note an important insight on bundling from the literature on optimal product variety. This literature<sup>69</sup> grew

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<sup>68</sup> For a formal exposition of the theory, see David S. Evans & Michael Salinger, *The Role of Cost in Determining When Firms Offer Bundles and Ties* (2004) (working paper), [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=555818](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=555818).

<sup>69</sup> See, e.g., Avinash K. Dixit & Joseph E. Stiglitz, *Monopolistic Competition and Optimum Product Diversity*, 67 *AM. ECON. REV.* 297 (1977); Curtis B. Eaton & Richard G. Lipsey, *Product Differentiation*, in 1 *HANDBOOK OF INDUSTRIAL ORGANIZATION*, *supra* note 11, at 723; Steven Salop, *Monopolistic Competition with Outside Goods*, 10 *BELL J. ECON.* 141 (1979); Michael A. Spence, *Product Selection, Fixed Costs, and Monopolistic Competition*, 43 *REV. ECON. STUD.* 217 (1976).

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out of Chamberlin's theory of monopolistic competition.<sup>70</sup> It addresses whether, in the presence of product-specific scale economies, the market provides too little variety, too much, or the right amount. The essential features of the models are fixed costs that give rise to scale economies, unique products that give rise to downward sloping demand curves for each firm, and free entry that prevents firms from earning economic profits. The models highlight a fundamental trade-off between exactly matching each customer's preferences and achieving economies of scale. The literature finds that under monopolistic competition firms may offer too few or too many varieties.

The broad assumptions of the product variety models—heterogeneous consumer preferences and fixed costs of product offerings—apply to bundled products and individual components, but the details of the existing models are not easy to adapt to the situation in which one product is a bundle of two other products.<sup>71</sup> Here we present a simple economic model with assumptions similar to the product variety literature but which are specifically designed to address bundling and tying. We use the model to help explain the case studies of bundling and tying in competitive industries.

In the model, there are two products, denoted 1 and 2. We consider heterogeneous consumers—one group that wants only the first product, another that wants only the second, and a third that wants both. To capture efficiencies of bundling, we consider the possibility of marginal cost savings from providing the two products together: that is, the cost of providing an extra unit of both products is lower if they are provided in tandem. (While we posit these as cost savings to the firm, they could also be cost savings for the consumers or quality improvements for the consumers.) We also consider the role of fixed costs—on the one hand offering only a bundle could save some fixed costs of providing the components separately; on the other hand offering a bundle in addition to the components results in additional fixed costs. It turns out that these fixed costs and the product-specific scale economies they generate are critical to determine when tying occurs. Finally, to capture the absence of market power, we assume that the prospect of entry prevents firms from selling any product at more than the average total cost of providing it.<sup>72</sup>

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70 EDWARD H. CHAMBERLIN, *THE THEORY OF MONOPOLISTIC COMPETITION* (1933).

71 The fact that a bundle is a combination of two distinct products has implications for both cost and demand that are not easy to capture with the demand and cost structure of these models.

72 The theory of contestable markets considers price competition in the presence of scale economies and assumes that the threat of entry limits firms to charging a price equal to their average cost rather than to marginal cost (for multi-product firms with joint costs, "average cost" is not well defined, but a similar zero-profit condition holds). See WILLIAM J. BAUMOL ET AL., *CONTESTABLE MARKETS AND THE THEORY OF INDUSTRY STRUCTURE* 4ff, 47 (1982). The theory has fallen into disuse because of analytical problems, see Martin L. Weitzman, *Contestable Markets: An Uprising in the Theory of Industry Structure: Comment*, 73 *AM. ECON. REV.* 486 (1983)), and because empirical research failed to confirm the predictions of the theory in airlines, the industry that was often held out as the canonical example of a contestable market. See Elizabeth E. Bailey & John C. Panzar, *The Contestability of Airline Markets During Transition to Deregulation*, 44 *J.L. & CONT. PROBS.* 125 (1981), for the suggestion that airline markets should be considered contestable. See Steven A. Morrison &

Under these general assumptions it is possible for markets to provide different product varieties or, more precisely, configurations of the basic products. The five possible configurations, as shown in Table 1, are

- (1) Pure component selling—each product is offered separately and not together;
- (2) Mixed bundling—the two products are offered together as well as separately;
- (3) Pure bundling—the two products are offered only together;
- (4) Bundle plus the first component separately; and
- (5) Bundle plus the second component separately.

Cases (2)-(5) involve bundling—the two products are offered together. Cases (3)-(5) involve tying—at least one of the two products is not offered separately. Note that we use “tying” strictly in an economic sense; only a subset of economic ties might ever be considered anticompetitive.<sup>73</sup>

**Table 1. Product Availability Under Different Bundling Scenarios**

	Good 1	Good 2	Goods 1 & 2
Pure Components	Y	Y	N
Mixed Bundling	Y	Y	Y
Pure Bundling	N	N	Y
Bundle + 1	Y	N	Y
Bundle + 2	N	Y	Y

Note: Y indicates that the component or bundle is offered, and N denotes that it is not.

Which products are offered depends on the extent to which bundling lowers marginal cost, on the fixed costs of offering each product, and on demand. For a product to be offered in the kind of contestable market we describe here, three conditions must hold—these are known in the formal economics literature as sustainability conditions. First, no price can exceed average cost. Otherwise another firm could enter and provide the product to the same group of customers for less. Second, the price of each product must be low enough that the seller of a second existing product cannot profitably lower

Clifford Winston, *Empirical Implications and Tests of the Contestability Hypothesis*, 30 J.L. & ECON. 53 (1987), for evidence rejecting some predictions of the contestability hypothesis in the airline industry. We do not suggest that any of the markets we consider are perfectly contestable; however, to the extent that the primary constraint on firms' pricing behavior is the threat of entry, the contestability assumption might yield the best approximation among the available alternatives even if the threat of entry does not limit firms to zero economic profits.

<sup>73</sup> A good example is pure bundling. Under *Jefferson Parish*, the plaintiff would have to show that there is a demand for the component.

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its price and attract the purchasers of the first.<sup>74</sup> Third, prices must be low enough that entry with a product not offered is unprofitable.<sup>75</sup>

We derive several notable results.<sup>76</sup>

First, marginal cost savings are neither necessary nor sufficient for tying to occur in competitive markets. They are not necessary because, even without marginal cost savings, firms may not separately provide a product if there is not enough demand to cover the fixed cost of offering that product; this result assumes that the firm is offering a bundle that attracts at least some consumers who want that product. They are not sufficient because, even with marginal cost savings, firms may find that there are enough consumers who want the products separately and do not value the other product; they will therefore offer the bundle to attract consumers who want both and separate products to attract consumers who only want one.

Second, fixed costs are a necessary but not sufficient condition for tying to occur in competitive markets. Firms eliminate a product choice that some consumers want because it enables them to avoid the fixed costs of offering it separately. Or, to put it another way, firms cannot provide some products separately because there is not enough demand to cover the costs.

Third, pure bundling can arise for two reasons which are worth distinguishing: (1) moderate fixed costs when many consumers demand all components and demand is low for at least one of the individual components; and (2) high fixed costs. Without fixed costs, our assumptions generally imply mixed bundling. Under mixed bundling, the bundle is available for those who want both goods and the separate products are available for those who want just one. With some fixed costs, however, pure bundling can result if many customers want both goods and demand for the components does not justify the fixed cost of offering them separately. Pure bundling can also occur, however, even if no consumer wants both components. This will happen when fixed costs are very high, which in turn implies that pure bundling saves significant fixed costs over components selling.<sup>77</sup>

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74 Consider, for example, mixed bundling focusing on the prices of good 1 and the bundle. People who want just good 1 can meet their needs by buying good 1 as a separate item or by buying the bundle and discarding good 2. For good 1 to be offered in a sustainable combination, the price of good 1 must be less than what the price of the bundle would be when it is priced to attract the consumers who want just good 1 as well as the customers who want both components. This condition is stronger than the condition that the price of good 1 be less than the price of the bundle under mixed bundling. For an elaboration, see the discussion of the example in Table 3 *infra*.

75 For example, pure components selling is only sustainable if there is no price at which the bundle could profitably be offered.

76 Evans & Salinger, *supra* note 68.

77 Personal computer software that comes in a box with both Windows and Mac versions illustrates this possibility. It is likely that everyone who buys the software wants one or the other, but not both. However, the single package with both versions saves the fixed cost of having two separate products.

Fourth, firms may sell some but not all of the components separately from the bundle. This occurs when demand for the bundle and one of the separate components is substantial but demand for the other is not.

In a separate welfare analysis we show that firms may not offer the optimal product variety (the standard result in the product variety literature) but that the tendency is to offer too much mixed bundling rather than to offer too much tying.<sup>78</sup>

#### B. *Model Assumptions and Numerical Examples*

In this Section, we briefly present the assumptions of the model and provide some numerical examples to illustrate the possible outcomes. There are two goods<sup>79</sup> denoted by subscripts 1 and 2 which can be sold either separately or bundled.<sup>80</sup> There are three classes of customers: type 1 customers want only good 1, type 2 customers want only good 2, and type B customers want both;  $X_1$ ,  $X_2$ , and  $X_B$  are the numbers of each type of customer.<sup>81</sup> Let  $c_1$  and  $c_2$  be the constant marginal costs of producing goods 1 and 2, and  $c_B$  the constant marginal cost of producing the bundle.  $F_1$  and  $F_2$  are the fixed costs of providing goods 1 and 2, and  $F_B$  is the fixed cost of offering the bundle.

We introduce possible cost savings from bundling in two ways. First, we assume that  $c_B \leq c_1 + c_2$ ; there are no marginal cost savings of bundling when equality holds. Second, we assume that  $F_B \leq F_1 + F_2$ ; there are no fixed costs savings of bundling when equality holds. For expositional ease we consider the special case where  $F_1 = F_2 = F_B = F$ ; that is when there is a fixed cost of offering each product, such as shelf space limitations or other distribution costs.

78 Evans & Salinger, *supra* note 68.

79 While the "goods" in the model can correspond to actual goods that could be sold separately, they can also correspond to features as well. To take the examples discussed in Parts III, IV, and V below, a cold/sinus tablet containing a pain reliever and a decongestant is the combination of two goods that can be (and are) sold separately. So is a package of four electrical adapters. Some of the automobile options we consider, such as an automobile sound system, can be purchased separately. As far as we know, however, there is no market to get electronic locks installed on cars that come without them. Thus, much of what we label as tying in that case concerns "features" rather than goods. This distinction might conceivably be important for determining whether a tie is illegal, but it does not affect the underlying economic principles. Consider, for example, the distinction between first class and coach airline service. The former typically involves a larger seat, a better meal, and free alcoholic beverages. All are included in the premium for a first class ticket. One cannot buy the larger seat and forego the cost of the drinks. Whether or not the better meal and drinks are labeled "features" or "products," the model captures the essence of the situation. Some people who want the additional room would also choose to pay extra for a better meal and alcohol, but others would not; and the airline does not give them the choice.

80 While we focus on two goods and three types of customers, the model could be generalized to any number of products and demand groups.

81 Customers of each type are willing to pay much more for the good they want than what they might have to pay in the market to obtain it. This treatment assumes perfectly inelastic demand within groups and no mobility between groups. This stylized treatment of demand greatly simplifies the exposition (particularly of the numerical examples). Accounting for demand elasticity within groups has no substantive impact on the results. See Evans & Salinger, *supra* note 68.

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The assumption that markets are contestable implies that prices equal average cost. Table 2 shows the average cost (and, therefore, the price in a contestable market) of each product given the entire set of product offerings.<sup>82</sup>

**Table 2. Offerings and Prices**

<i>Available Goods</i>	<i>Outcome</i>	<i>Price</i>		
		<i>1</i>	<i>2</i>	<i>B</i>
All	Mixed Bundling	$c_1 + \frac{F}{X_1}$	$c_2 + \frac{F}{X_2}$	$c_B + \frac{F}{X_B}$
1 and 2	Components	$c_1 + \frac{F}{X_1 + X_B}$	$c_2 + \frac{F}{X_2 + X_B}$	
Bundle only	Pure Bundling			$c_B + \frac{F}{X_1 + X_2 + X_B}$
Bundle and Good 1	Good 1 tied to Good 2	$c_1 + \frac{F}{X_1}$		$c_B + \frac{F}{X_2 + X_B}$
Bundle and Good 2	Good 2 tied to Good 1		$c_2 + \frac{F}{X_2}$	$c_B + \frac{F}{X_1 + X_B}$

We now turn to some hypothetical numerical examples that illustrate the different possible outcomes in our model and how they depend on the underlying parameter values. In our first example, our assumptions about demand and costs give rise to mixed bundling. We focus on this case in some detail in order to make clear the meaning of the sustainability condition. We then describe how a change in each parameter would cause the sustainable outcome to change. We then consider three additional examples that illustrate particularly interesting possibilities.

Table 3 contains our first example. The size of each group of consumers is 100. The marginal costs of both goods 1 and 2 are 8 while the marginal cost of the bundle is 14. Since the latter is less than the sum of the components' prices, there are marginal cost savings from bundling. Fixed costs are 600.<sup>83</sup> It

<sup>82</sup> The average cost of a product depends on the quantity purchased, which in turn depends on what other products are offered.

<sup>83</sup> Even though we assume in these examples that the fixed cost of each product offering is the same, we list the size of the fixed cost for each offering to emphasize that they could be different in a more general model.

follows that the prices of the components under mixed bundling are 14 while the price of the bundle is 20.<sup>84</sup> As the next line in the Table indicates, the price of the bundle under pure bundling is 16.<sup>85</sup> It is lower than the price of the bundle under mixed bundling because more customers share the fixed cost. Under components selling, the prices of the components are 11 each.<sup>86</sup> As with pure bundling, the prices are lower than under mixed bundling because the fixed costs are shared with a larger group.<sup>87</sup>

**Table 3. An Example of Mixed Bundling**

	Good		Bundle
	1	2	
<b>Assumed Values</b>			
Demand ( $X$ )	100	100	100
Marginal Cost ( $c$ )	8	8	14
Fixed Cost ( $F$ )	600	600	600
<b>Prices</b>			
Mixed Bundling	14	14	20
Pure Bundling			16
Components	11	11	
Bundle and Good 1	14		17
Bundle and Good 2		14	17

Before turning to why mixed bundling is sustainable, let us consider why the other product configurations are not.<sup>88</sup> Under pure bundling, the price of the

<sup>84</sup> The calculations are  $8 + 600/100 = 14$  for the component price and  $14 + 600/100 = 20$  for the bundle price.

<sup>85</sup> The calculation is  $14 + 600/(100 + 100 + 100) = 16$ .

<sup>86</sup> The calculation is  $8 + 600/(100 + 100) = 11$ .

<sup>87</sup> To complete the table, the price of good 1 when good 1 and the bundle are offered is  $8 + 600/100 = 14$ . The price of the bundle in that case is  $14 + 600/(100 + 100) = 17$ . The calculations when good 2 and the bundle are offered are comparable.

<sup>88</sup> We noted above that the bundling efficiencies could be convenience realized by consumers rather than cost savings for firms. Such convenience would be reflected in a willingness to pay a premium for the bundle rather than both components separately and would therefore affect the sustainability conditions. In Table 3, for example, one of the sustainability conditions for mixed bundling is that the price of the bundle under mixed bundling (20 in Table 3) be less than the sum of the prices of the components under components selling ( $11 + 11 = 22$  in Table 3). If, however, consumers who want both components strictly preferred to buy them in bundled form and were willing to pay, say, a 2.50 premium to do so, then the bundle price could be as high as 24.50 (computed as  $22 + 2.50$ ) for the condition to hold. Similarly, customers who want just one component might strictly prefer *not* to get the other. (That is, our implicit assumption of free disposal might not apply.) The model can also handle this twist with a modification of the sustainability conditions. For example, with free disposal, the price of good 1 under mixed bundling (14 in Table 3) must be less than what the price of the bundle would be if only the bundle and good 2 were offered (17 in Table 3). If, however,

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bundle is 16. This price is susceptible to entry by, say, a producer of good 1 at a price of 14.<sup>89</sup> This component price is less than the 16 that group 1 pays for the bundle under mixed bundling, and it is sufficient to cover costs even if only group 1 buys the bundle. Pure components selling, in which the price of each of the two goods is 11, is not sustainable either. Group B pays a total of 22 for the two components, so entry with the bundle at a price of 20 attracts group B and is profitable. When the bundle and just good 1 are offered, the price of the bundle is 17. Entry by a supplier of good 2 at a price of 11 is then profitable. For the same reason, it is not sustainable to offer just the bundle and good 2.

Having seen how entry can prevent a set of offerings from being sustainable, we can now understand why mixed bundling is sustainable in this case. All possible products are offered in mixed bundling, so it is not possible to enter with a new product. We do, however, need to consider whether cutting the price of an existing product (or products) to attract an additional block of customers would be profitable. At these prices, it is not. For example, to sell the bundle at a price that is low enough to attract groups 1 and 2, one would still have to charge 16.<sup>90</sup> But that would not be low enough to attract groups 1 and 2, which can purchase only the good they want under mixed bundling for 14. Similarly, cutting the price of the components to attract group B would not be profitable. If group B purchased the components, the prices would still have to be 11. Group B would then pay 22 for both goods, which is more than the 20 it pays for the bundle under mixed bundling.

There are a number of factors that give rise to mixed bundling in this example. First, there are marginal cost savings from bundling. At the same time, the marginal cost of the bundle exceeds the marginal cost of just one of the components. So, putting fixed costs aside, there would be an advantage to having the separate components available to those who want just one of them. Also, the demand for each of the three possible products is substantial; and, while fixed costs are present, they are not so great as to preclude offering one of the goods.

The results in Table 3 depend, of course, on the assumed values for each of the seven variables in the model.<sup>91</sup> Small changes in each variable would affect prices, but mixed bundling would still be the qualitative outcome. With larger changes, however, the qualitative outcome would change as well. Since mixed bundling means that all three of the possible products are offered, any change would eliminate one or more of the products offered.

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those who want just good 1 would be willing to pay 1 more to buy it separately rather than as part of a bundle, then the condition becomes that the price of good 1 cannot be more than 18, not 17.

89 It is susceptible to entry by good 2 as well.

90 As Table 3 indicates, that is the price of the bundle under pure bundling.

91 The seven parameters are: the number of people who want good 1 ( $X_1$ ), the number of people who want good 2 ( $X_2$ ), the number of people who want both goods ( $X_B$ ), the marginal cost of good 1 ( $c_1$ ), the marginal cost of good 2 ( $c_2$ ), the marginal cost of the bundle ( $c_B$ ), and the fixed cost of an offering ( $F$ ).



For example, consider a reduction in the number of people who want just good 1. The fixed cost of offering good 1 would then have to be spread over a smaller customer base so the price of good 1 would have to increase. When the number of people who want only good 1 is sufficiently small, the price of good 1 would exceed the price of the bundle.<sup>92</sup> Consumers who want just good 1 would then buy the bundle (and discard good 2). Good 1 would disappear from the market, leaving good 2 and the bundle as the only products offered. In that case, good 2 is tied to good 1.

Just as a reduction in the number of people who want good 1 causes the price of good 1 to go up, an increase in  $X_1$  causes the price to drop. With a sufficiently large increase in the demand for good 1 alone, the price can drop enough that people who want both goods find it cheaper to buy them separately.<sup>93</sup> The bundle disappears from the market. The result is pure components selling, which does not entail tying.

Table 4 shows the change in product offerings that could result from sufficiently large increases and decreases of each of the seven variables in the model. (As we note, in some cases, even a large change will not alter the product offerings.) The first row of the table reports the results described above. The left half of that row says that with a sufficiently large decrease in  $X_1$ , the set of products offered becomes the bundle and good 2 while good 1 is no longer offered. The right hand half of the first row shows that with a sufficiently large increase in the demand for good 1, the set of products offered are goods 1 and 2 while the bundle is no longer offered.

As Table 4 indicates, there are two cases in which mixed bundling is the qualitative outcome no matter how much the variable changes (in the given direction). One of these is a reduction in fixed costs. That result makes intuitive sense. Fixed costs in the model can cause a potential product not to be offered. Given the other assumed values in Table 4, fixed costs of 600 are low enough that all three of the possible products can be offered profitably. A reduction in the fixed cost of a product offering would only reinforce the

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92 Holding the other values in Table 3 constant, mixed bundling is sustainable when demand for good 1 alone is 62 but not when it is 61. When  $X_1 = 61$ , the price of good 1 would have to be  $8 + 600/61 = 17.83$ . It might seem surprising at first that the people who want good 1 would not buy it at that price, since it is less than 20, the price of the bundle under mixed bundling. However, if the bundle is priced to attract those who want just good 1 as well as those who want both goods, then it can be offered at a price of  $14 + 600/(100 + 61) = 17.73$ .

93 For consumers who want both goods to buy them separately, the sum of the prices of the separate goods must drop below 20, which is the price of the bundle under mixed bundling. One might suspect that this could not happen since the price of good 2 under mixed bundling is 14 and the price of good 1 cannot drop below the marginal cost of 8. However, if good 2 is sold to the group that wants both goods as well as the group that wants just good 2, the fixed cost is spread over a larger group and the price of good 2 can be lowered to 11. Provided the number of people who want just good 1 is large enough so that the price can be lowered below 9, then the bundle can no longer be offered profitably. This happens when 501 people want just good 1. (In that case, total demand for good 1—including the 100 customers who want both goods—is 601, and the price of good 1 is  $8 + 600/601 = 8.998$ .)

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possibility of providing for each group the product tailored to its particular demand.

**Table 4. Possible Change in Product Offering Due to Large Changes in Assumed Values**

<i>Parameter</i>	Parameter Decreases		Parameter Increases	
	<i>Offered</i>	<i>Not Offered</i>	<i>Offered</i>	<i>Not Offered</i>
$X_1$	Bundle and Good 2	Good 1	Goods 1 and 2	Bundle
$X_2$	Bundle and Good 1	Good 2	Goods 1 and 2	Bundle
$X_B$	Goods 1 and 2	Bundle	Goods 1 and 2, Bundle	None
$c_1$	Goods 1 and 2	Bundle	Bundle, Good 2	Good 1
$c_2$	Goods 1 and 2	Bundle	Bundle, Good 1	Good 2
$c_B$	Bundle	Goods 1 and 2	Goods 1 and 2	Bundle
$F$	Bundle, Goods 1 and 2	None	Bundle	Goods 1 and 2

Note: Each row shows the set of products offered when the value of a variable assumed in Table 3 changes enough to change the set of product offerings. The left half represents decreases in the variables while the right half represents increases. In turn, each half has two cells, one showing the product(s) that continue to be offered and one showing the product(s) not offered.

When  $X_B$  increases, there is still no change to the set of product offerings. To understand that result, consider Table 3. The prices of goods 1 and 2 are 14, which is also the marginal cost of the bundle. No matter how big  $X_B$  gets, the price of the bundle cannot fall below 14, so the separate components continue to be offered for any possible increase in  $X_B$ . This result is not completely general. If  $c_B$  were only 13, then a sufficiently large increase in  $X_B$

could make it possible to offer the bundle for a price below 14, in which case pure bundling would result.<sup>94</sup>

**Table 5. An Example of Pure Bundling Due To High Fixed Costs**

	Good		Bundle
	1	2	
Assumed Values			
Demand ( $X$ )	100	100	0
Marginal Cost ( $c$ )	8	8	16
Fixed Cost ( $F$ )	1800	1800	1800
Prices			
Mixed Bundling	26	26	$\infty$
Pure Bundling			25
Components	26	26	
Bundle and Good 1	26		34
Bundle and Good 2		26	34

The right half of the last row, which reports the effects of increases in  $F$ , is of particular interest. Not surprisingly, a higher fixed cost of a product offering reduces the number of products offered. Most interesting though is that if  $F$  increases enough it results in pure bundling. This result depends in part on the precise values underlying Table 3. There are other parameter values for which some increase in  $F$  would make it unprofitable to offer the bundle and still others when an increase in  $F$  would make just one of the components unprofitable.<sup>95</sup>

Even when moderate increases in  $F$  do not cause pure bundling, sufficiently large increases in  $F$  do. Indeed, this is the case even when no one wants both goods ( $X_B = 0$ ) and there are no marginal cost savings ( $c_B = c_1 + c_2$ ). The case reported in Table 5 illustrates the point. All but three of the parameters are the same as in the first example—the exceptions are that  $X_B = 0$ ,  $c_B = 16 = c_1 + c_2$ , and  $F = 1800$ . By themselves, the first two assumptions would result in components selling. With no one demanding both goods and no marginal cost savings, there would appear to be no reason for the bundle to exist. Indeed, there is no reason for the bundle to exist *in addition to* the

94 Since there are seven variables whose effects interact, it would take a large number of tables to provide a complete representation of the model's comparative statics. Readers interested in a more complete and formal exposition of the model should consult Evans & Salinger, *supra* note 68.

95 It is easy to find values for each case that give rise to each possibility. For example, when the number of people who demand just good 1 is relatively small, then an increase in  $F$  can make it unprofitable to offer good 1. Similarly, if the number of people who demand both goods is relatively small, then an increase in  $F$  can make it unprofitable to offer the bundle.

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separate components. With sufficiently high fixed costs, however, the bundle can be offered *instead* of the two components. The advantage of the bundle is that it meets the needs of both groups ( $X_1$  and  $X_2$ ) with a single product offering and a single fixed cost. With sufficiently high fixed costs, the fixed cost savings outweigh the "wasted" marginal cost in providing each customer with a component he does not want.

**Table 6. An Example of Pure Bundling Due To Insufficient Demand for Components**

	Good		Bundle
	1	2	
<b>Assumed Values</b>			
Demand ( $X$ )	50	50	100
Marginal Cost ( $c$ )	8	8	14
Fixed Cost ( $F$ )	600	600	600
<b>Prices</b>			
Mixed Bundling	20	20	20
Pure Bundling			17
Components	12	12	
Bundle and Good 1	20		18
Bundle and Good 2		20	18

Table 6 provides another set of parameters under which pure bundling is the only sustainable outcome. The rationale for pure bundling is, however, fundamentally different from the one in Table 5. The parameters are similar to the first example in Table 3 except that  $X_1$  and  $X_2$ , which are the demands for the individual components, are 50 instead of 100. Here, pure bundling arises because many customers want both components and demand for the separate components is too low to justify offering them. (Note, however, that the demand is not so low as to be trivial.)

Thus far we have stressed which offerings are sustainable. It is natural to ask whether the sustainable outcomes are efficient. Consider Table 7, in which we have changed two parameters from the base case. The marginal cost of the bundle is now 16, so there are no marginal cost savings from bundling, but the size of the group that wants the bundle is 200, so a larger fraction of customers wants the bundle. Without any marginal cost savings from bundling, mixed bundling is inefficient from a social standpoint relative to components selling. It simply generates an additional fixed cost. Yet, mixed bundling is the only sustainable outcome. The price of the bundle under mixed bundling is 19, which is less than the sum of the prices of the components under component selling.

**Table 7. An Example in Which Mixed Bundling Is Inefficient**

	Good		Bundle
	1	2	
<b>Assumed Values</b>			
Demand ( $X$ )	100	100	200
Marginal Cost ( $c$ )	8	8	16
Fixed Cost ( $F$ )	600	600	600
<b>Prices</b>			
Mixed Bundling	14	14	19
Pure Bundling			17.5
Components	10	10	
Bundle and Good 1	14		18
Bundle and Good 2		14	18

To see why mixed bundling arises in this example, consider the total expenditures of group  $B$  under components selling. It purchases both components for a price of 10 each. That price consists of a marginal cost of 8 and an average fixed cost of 2. Since members of this group buy both goods, each one's total expenditure consists of 16 in marginal costs and 4 in average fixed costs. With the bundle, the price they pay still reflects a marginal cost of 16, but their share of the fixed cost is only 3. Thus, the bundle offers private savings to group  $B$ , which now only has to share in one fixed cost. The private savings to group  $B$  is not, however, a social savings. Rather, the additional fixed cost is a social cost.

This last example has three important implications.

First, the market outcome is not necessarily efficient, in the sense that a social planner with full information and no costs of imposing a solution could do better. That should not be surprising in light of the results in the product selection literature that the set of product offerings is not necessarily efficient.<sup>96</sup>

Second, while the model reveals a bias toward the offering of a bundle, the bias is primarily toward mixed bundling, not toward pure bundling or other forms of tying. Indeed, although the preceding example does not show it, the model can be interpreted to suggest a bias *against* pure bundling. In a companion paper, we show that the conditions for pure bundling to be the only sustainable outcome are stronger than the conditions for pure bundling to be the efficient outcome.<sup>97</sup> The model does not rule out the possibility of inefficient

96 See Carlton & Waldman, *supra* note 5; Whinston, *supra* note 5.

97 See Evans & Salinger, *supra* note 68.

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tying. Tying can be the predicted outcome when components selling is optimal, but there is no systematic reason for this to be the case. There is a tendency in the model for big groups to get the offering they want. But this effect holds equally when the biggest group wants just one component as when the biggest group wants the bundle.

Third, in analyzing the welfare consequences of bundling discounts (under mixed bundling), it is important to distinguish between marginal cost savings and the effect of fixed costs. Both are potential sources of savings to the group that purchases the bundle, but only the marginal cost savings reflect welfare gains. In this example, there is a substantial bundle discount; the bundle price of 19 is 5 less than the sum of the components' prices. Under pure components selling, they would pay a total of 20, which is also more than the bundle price under mixed bundling. Notwithstanding this private benefit, it is inefficient for the bundle to be offered. In contrast, if there were no fixed costs and the bundle discount reflected a marginal cost savings of 5, then mixed bundling would be efficient.

### *C. Insights from Cost-Based Theory*

The principal insight from the model is that competitive firms can eliminate certain configurations of products for two roughly equivalent reasons. First, they eliminate a choice because it saves costs, resulting in lower prices for the other configurations. For example, firms may prefer lowering prices for components to offering a bundle. Second, they eliminate choice because it is not profitable to offer that choice to the group of consumers who want that choice. For example, firms may not find it profitable to offer the bundle because there are not enough customers who value the bundle to cover the fixed costs of offering it.

Tying, in particular, results when there are fixed costs of offering a product separately and there are not enough consumers who want that product separately. The pure bundling case highlighted how tying comes to be—significant fixed costs make it cheaper to sell everyone a bundle even if they do not want one or more component; and low demand for the separate goods makes it difficult to cover even modest fixed costs of product offerings.

In the next three Parts we will explore how costs and demand give rise to different product offerings in several industries. Over-the-counter cold remedies and pain relievers provide an example of mixed bundling. Many consumers want these drugs separately while many others want them combined. Foreign electrical plug adapters provide an example of pure bundling. Most consumers do not want all of the adapters that come in a typical package. Finally, we consider mid-sized automobiles and contrast the option strategies that different manufacturers have taken. We document that over time, Ford's offerings of optional equipment have moved from mixed bundling to nearly pure bundling. In restricting the set of option combinations to those for which there is

substantial demand, Ford adopted a new strategy that resembles the longer-standing practices of its Japanese rivals Honda and Toyota. Ford's shift in strategy may reflect a recognition that there are fixed costs of offering many options.

### III. Over-the-Counter Cold Remedies and Pain Relievers

Any visitor to the cold remedies aisle at a drug store in the United States sees a bewildering array of concoctions. Remedies vary by daytime or nighttime, dose, combination of ingredients, and type of pill. The cough and cold remedies market segment has been called the most competitive over-the-counter drug category in North America.<sup>98</sup> Pharmaceutical firms have competed by creating line extensions throughout the cough and cold segment, blurring the borders between formerly well-defined segments.<sup>99</sup> Some of the products available are combinations of products available separately. As we document, the price of these combinations is substantially less than the sum of the prices of buying the component drugs separately.

#### A. Background

Someone who has a cold (but not a cough) and would like a remedy to help get through the day typically has two needs: a decongestant (to relieve stuffiness) and a pain reliever (to relieve headaches). Someone who has a headache but no congestion does not need a decongestant; someone who has congestion but no headache has no need for a pain reliever—there are thus distinct demand groups for each of the components. We focus on a small number of examples of pain relievers, decongestants, and combinations that involve the two. The pain relievers have acetaminophen as the active ingredient (e.g., Tylenol pain reliever) while the decongestants have pseudoephedrine hydrochloride as the active ingredient (e.g., Sudafed decongestant).

Acetaminophen is a widely used pain reliever which has been used medically since 1893 but which did not gain popularity in the United States until the 1950s. The FDA approved Extra Strength Tylenol for over-the-counter use in July 1975 although the regular dose had been available since 1955. There are no secrets to the chemical structure or manufacture of acetaminophen. At least 145 firms produce branded or generic versions of drugs for which acetaminophen is an active ingredient.<sup>100</sup> Tylenol is the best-known brand as a result of early entry and extensive advertising and promotion. Drug

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<sup>98</sup> Mick Maroney, *North America's OTC Cough Cold Market*, PHARMA MARKETLETTER, Mar. 9, 1992.

<sup>99</sup> *Id.*

<sup>100</sup> Food & Drug Admin., National Drug Code Database, at <http://www.fda.gov/cder/ndc/database/faq.htm> (last visited Nov. 23, 2004).

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stores in the United States typically carry generic versions of acetaminophen; large chains such as CVS, Walgreens, and Rite-Aid have private-label generic versions. Drug store chains can contract with a number of firms to manufacture and package their private-label versions.<sup>101</sup> As a pain reliever, the various acetaminophen-based drugs compete with numerous other remedies, including other off-patent, over-the-counter pain relievers like aspirin (Bayer being a leading brand), ibuprofen (Advil and Motrin<sup>102</sup> being leading brands), and naproxen sodium (Aleve<sup>103</sup> being a leading brand). Combination pain relievers also exist: Excedrin (and private-label copies) typically consists of aspirin, acetaminophen, and caffeine. Analgesics appear to be highly competitive.<sup>104</sup>

Pseudoephedrine hydrochloride is a widely used decongestant. It has been approved for over-the-counter use since 1976.<sup>105</sup> There are no secrets in its chemical structure or manufacture. At least 155 firms now produce branded or generic versions of drugs for which it is an active ingredient.<sup>106</sup> Although Sudafed is the best-known brand, drug stores in the United States also carry private-label versions. As with acetaminophen, drug store chains can contract with a number of firms to manufacture and package the drug.<sup>107</sup> Pseudoephedrine hydrochloride appears to be the most widely used decongestant in pill form in the United States.<sup>108</sup> Nasal sprays sometimes use other compounds (e.g., oxymetazoline and phenylephrine). One side effect of pseudoephedrine hydrochloride is that it can act as a stimulant, interfering with sleep.<sup>109</sup> It therefore is typically not used in "nighttime" dosages unless

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101 Leiner Health Products, Inc. manufactured acetaminophen for customers such as Wal-Mart, Costco, Target, and Safeway as of November, 2001. Pharmaceutical Formulations, Inc., manufactured acetaminophen for companies such as Kmart, Eckerd, and Duane Read. FED. TRADE COMM'N, *Analysis of Proposed Consent Order to Aid Public Comment*, at <http://www.ftc.gov/os/2001/11/leineranalysis.htm> and <http://www.ftc.gov/os/2001/11/phformulationsanalysis.htm> (last visited Feb. 13, 2004).

102 Motrin, like Tylenol, is a brand owned by McNeil. So is the St. Joseph brand of low-dosage aspirin. Press Release, Johnson & Johnson Company, McNeil Acquires St. Joseph Business from Schering-Plough Healthcare Products (Dec. 19, 2000), [http://www.jnj.com/news/jnj\\_news/20020307\\_1406.htm](http://www.jnj.com/news/jnj_news/20020307_1406.htm) (last visited Nov. 23, 2004).

103 Aleve is a brand owned by Bayer. BAYER HEALTHCARE AG, Products, at <http://www.bayerhealthcare.com/index.php?id=25&L=2&countryID=35&divisionID=3> (last visited Nov. 23, 2004).

104 *Intense Competition Under Way in Arena (Analgesics)*, CHAIN DRUG REVIEW, Aug. 15, 1994.

105 Consumer Healthcare Products Ass'n, *Ingredients & Dosages Transferred From Rx-to-OTC Status (or New OTC Approvals) by the Food and Drug Administration Since 1975* (July 3, 2003), available at [http://www.chpa-info.org/web/advocacy/general\\_issues/Switch/switch\\_list.pdf](http://www.chpa-info.org/web/advocacy/general_issues/Switch/switch_list.pdf) (last visited Nov. 22, 2004).

106 Food & Drug Admin., *supra* note 100.

107 See, e.g., Pharmaceutical Formulations Inc., *Frequently Asked Questions*, at <http://www.pfiotc.com/index.htm> (last viewed Nov. 11, 2004).

108 See Am. Health Ass'n, *Cardiology Patient Page*, at <http://circ.ahajournals.org/cgi/content/full/107/24/e215> (last visited February 13, 2004).

109 Note that consumers are not allowed to purchase pseudoephedrine hydrochloride in large quantities, since it can be used to manufacture methamphetamine ("speed"). See Diversion Control Program, U.S. Dep't of Justice, *Methamphetamine Anti-Proliferation Act of 2000 (MAPA)*—



accompanied by other drugs (such as older antihistamines) that cause drowsiness. The provision of pseudoephedrine hydrochloride appears to be highly competitive.

Many combination cold remedies are available. From the CVS web site, products that combine only acetaminophen and pseudoephedrine hydrochloride are available under the Tylenol, Sudafed, and CVS brand names. Similar combination products that use ibuprofen instead of acetaminophen are available under the Advil, Motrin, and CVS brand names. And other combination products that use naproxen sodium instead of acetaminophen are available under the Aleve brand name.

#### B. *Branded and Private-Label Cold Remedies*

We collected data on cold remedies sold at a Walgreens pharmacy in downtown Chicago as well as on web sites operated by the CVS and Walgreens chains. Both pharmacies sell private-labels that enable customers to buy pain relievers and decongestants separately or together. They also sell the branded drugs. Tylenol is available by itself or bundled with a generic decongestant; Sudafed is available by itself or bundled with a generic pain reliever.

The variations available are extensive. The CVS web site lists the following numbers of alternatives, based on dosages, package sizes, delivery systems (caplets, tablets, liquids, etc.) and drug combinations:

- Twenty-two products under the Sudafed brand name, all containing pseudoephedrine hydrochloride;<sup>110</sup>
- Over fifty products under the Tylenol brand name, all containing acetaminophen;<sup>111</sup>
- At least twenty-eight CVS-brand products containing pseudoephedrine hydrochloride;<sup>112</sup>
- Over fifty CVS-brand products containing acetaminophen.<sup>113</sup>

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*Frequently Asked Questions*, at [http://www.deadiversion.usdoj.gov/chem\\_prog/faqs/mapa\\_faq.htm](http://www.deadiversion.usdoj.gov/chem_prog/faqs/mapa_faq.htm) (last visited Nov. 23, 2004).

110 A product search of <http://www.cvs.com> for the term "Sudafed" on Feb. 13, 2004, returned twenty-two hits. A similar search of <http://www.walgreens.com> returned twenty hits.

111 A product search of <http://www.cvs.com> for the term "Tylenol" on Feb. 13, 2004, returned over fifty hits, the apparent reporting limit of the search engine for the site. Using that and other searches, which are probably not comprehensive, we have been able to identify at least fifty-eight Tylenol products on the site. The Walgreens web site lists ninety Tylenol products.

112 A product search of <http://www.cvs.com> for the terms "CVS" and "pseudoephedrine hydrochloride" on Feb. 13, 2004, returned twenty-eight hits.

113 A product search of <http://www.cvs.com> for the terms "CVS" and "acetaminophen" on Feb. 13, 2004, returned over fifty hits, the apparent reporting limit of the search engine for the site. Using that and other searches, which are probably not comprehensive, we have been able to identify at least sixty-one CVS-brand products containing acetaminophen.

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**Table 8. Prices for 24 Tablet/Caplet Packages**

Brand	Combination	Pseudoephedrine HCl Only	Acetaminophen Only
Tylenol	\$5.99	NA	\$3.99
Sudafed	\$5.99	\$4.59	NA
CVS	\$3.99	\$3.49	\$2.99

Notes:

- Tylenol: "Tylenol Sinus Caplet" (the combination product) and "Tylenol Extra Strength Caplets."
- Sudafed: "Sudafed Sinus and Headache Caplet" (the combination product) and "Sudafed Sinus & Cold."
- CVS: "Non-Aspirin Sinus Caplets Maximum Strength" (the combination product), "Nasal Decongestant Tablets Maximum Strength," and "Non-Aspirin Caplets Extra Strength." NA denotes a combination that was not offered.
- Doses are 30mg of pseudoephedrine HCl and 500mg of acetaminophen.

Source: The CVS web site, <http://www.cvs.com>, Feb. 11, 2004.

Table 8 summarizes some of the price data we found for the combinations. The CVS brands for acetaminophen, pseudoephedrine hydrochloride, and their combination have substantially lower prices than the better-known brands, roughly 25-35% less.<sup>114</sup> More interestingly, there are substantial discounts for buying a bundle. A customer who buys separate packages of pain relievers and decongestants pays \$6.48 (\$3.49 for the pseudoephedrine hydrochloride and \$2.99 for the acetaminophen) for a package of twenty-four CVS private label tablets. A customer pays \$3.99 for a package of twenty-four CVS private label tablets that have the same dosage as the two separate packages. CVS therefore charges 38% less for the combination product than it does for the two separate products. Put another way, the incremental price of getting acetaminophen in combination with CVS pseudoephedrine is only \$0.50, which is approximately 17% of the price of purchasing the same quantity of CVS acetaminophen separately. The manufacturers of Tylenol and Sudafed do not sell generic versions of each other's main product separately—there is no Tylenol pure pseudoephedrine product and no Sudafed pure acetaminophen product.<sup>115</sup> But a customer who bought Tylenol and Sudafed

<sup>114</sup> This is a well-known phenomenon in pharmaceutical pricing. See *Q&A Brian Sharoff*, *PLMA, DRUG STORE NEWS*, Nov. 5, 2001, available at [http://www.findarticles.com/cf\\_dls/m3374/16\\_23/79868899/p1/article.jhtml](http://www.findarticles.com/cf_dls/m3374/16_23/79868899/p1/article.jhtml) (last visited Feb. 25, 2004); see also Patricia Winters, *Private-Label Health Aids Ease Competitive Pain; Food Stores See Profitable Remedy with Trend*, *ADVERTISING AGE*, May 10, 1993; WellPoint Pharmacy Management, *Drug Information Center - Generic Drugs*, at [https://www.healthenvelope.com/healthenvelope/page/drug\\_generic](https://www.healthenvelope.com/healthenvelope/page/drug_generic) (last visited Feb. 25, 2004).

<sup>115</sup> The CVS branded products shown in Table 8 show mixed bundling: consumers can purchase either component separately, or they can purchase the combination product. In contrast, the Tylenol products that are available technically reflect "tying": consumers can buy either the pain

separately would pay \$8.58 compared with \$5.99 for the combination; the combination therefore costs about 30% less than the separate products.

### C. *Explanations for the Bundled Discount*

The most striking empirical finding from this case is that the bundle discount is so large. If one presumes that the primary motive for mixed bundling is price discrimination, this case might initially seem to provide supporting evidence. But the cost-based theory provides a quite simple explanation not only for why the bundle is offered at a discount, but also for why the discount is so substantial. The costs of the active ingredients are a small portion of the total price of these products. For example acetaminophen costs approximately \$8 per kilogram, which corresponds to 0.4 cents for a 500 mg tablet or 9.6 cents for twenty-four tablets.<sup>116</sup> As a result, we should expect the cost of producing a package of tablets of decongestant and acetaminophen to be only slightly above the cost of producing a package of tablets with just decongestant.

Like any model, ours is just an approximation. To the extent that the prices are not exactly equal to costs, some price discrimination might be at play as well. But we doubt that models of price discrimination can provide as compelling an explanation for the size of the bundle discount as our cost model. To begin with, price discrimination in the absence of cost savings might imply a premium for the bundled product rather than a discount. The combination products provide convenience not only because someone suffering from a sinus headache might prefer to take half as many pills, but also because the labeling saves him the trouble of determining which active ingredients will relieve his symptoms. Even if price discrimination does qualitatively imply a bundle discount, demand for the bundled products would have to be much more elastic than demand for the unbundled products for price discrimination to be the sole explanation for the size of the discount we observe. Without measuring the elasticities directly, we cannot rule that out, but there is no compelling reason to expect such large differences.<sup>117</sup>

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reliever or the combination product, but they cannot purchase a Tylenol-branded decongestant. But the "tying" in question here is inconsistent with the monopoly leverage/foreclosure theories that underlay the current application of tying law: the "tying" product for Tylenol in this case would be the decongestant, and the "tied" product would be the pain reliever. That is, the "tying" product for the Tylenol brand is one for which Sudafed (not Tylenol) arguably has some market power. A corresponding issue arises with the Sudafed branded products in question: the "tying" product for the Sudafed brand is one for which Tylenol (not Sudafed) arguably has some market power.

<sup>116</sup> Mark Kirschner, *Acetaminophen (Chemical Profile)*, CHEMICAL MARKET REP., Aug. 11, 2003.

<sup>117</sup> Strategic explanations do not seem believable either. CVS (and the other drug store chains) engage in mixed bundling, not tying, so tying-related foreclosure stories are not applicable. Moreover, there is no reason to believe that CVS has appreciable market power in any of the component products or in the combination products. As a result, the foreclosure explanation is irrelevant for them. Tylenol and Sudafed are the leading brands in their narrow product categories,

## Why Do Firms Bundle and Tie?

Even under our cost-based model, a large bundle discount by itself does not necessarily imply that mixed bundling is the optimal outcome. Based on the first line of Table 2, the bundle discount implied by the model under mixed bundling ( $D$ ) is:

$$D = c_1 + \frac{F}{X_1} + c_2 + \frac{F}{X_2} - c_B - \frac{F}{X_B}$$
$$= (c_1 + c_2 - c_B) + \left( \frac{F}{X_1} + \frac{F}{X_2} - \frac{F}{X_B} \right)$$

The first set of parentheses represents marginal cost savings from bundling while the second set reflects fixed cost savings. As we illustrated with the example in Table 7, the private benefit consumers get from marginal cost savings is also social savings. The private benefit that a consumer gets from making a smaller contribution to fixed costs is not.

In this particular case, however, there is good reason to believe that marginal cost savings are significant. As noted above, the active ingredients in these medications represent a very small portion of the total price. Putting the active ingredients into dosage form and then packaging the tablets likely represents a much larger portion of costs. It is precisely these cost components that are the source of marginal cost savings. The bundled product requires one package rather than two and the production of half as many tablets.

Product-specific fixed costs are present in this case. For example, each separate product in a retail environment occupies a shelf slot, so a retailer may have to devote additional space to offer both the bundled products and the separate components. However, the proliferation of products that we observe suggests that these product-specific fixed costs are not large.<sup>118</sup>

We now turn to a case in which product-specific fixed costs do give rise to tying.

### IV. Foreign Electrical Adapters

Tying does occur in the case of foreign electrical adapters. In this case most customers are forced to buy a product that they do not want. The most

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and they do engage in "tying" with their combination cold remedies. But their "tying" is backwards: their leading brand components are available separately from their combination products.

118 In a companion paper, we provide rough decomposition of the bundle discount into marginal cost and fixed cost effects. We estimate that the bundled product does lower costs (in addition to any convenience it provides). See David S. Evans & Michael Salinger, *An Empirical Analysis of Bundling and Tying: Over-the-Counter Pain Relief and Cold Medicines* (CESifo Working Paper 1297, Oct. 2004), available at [http://www.cesifo.de/pls/guestci/download/CESifo+Working+Papers+2004/CESifo+Working+Papers+October+2004/cesifo1\\_wp1297.pdf](http://www.cesifo.de/pls/guestci/download/CESifo+Working+Papers+2004/CESifo+Working+Papers+October+2004/cesifo1_wp1297.pdf).

plausible explanation, given that this is a highly competitive market with low barriers to entry, is that there are product-specific scale economies (here from packaging and shelf space) and that bundling several adapters together satisfies "most customers" at the lowest cost. This case has another lesson: the explanation here is compelling mainly because competition rules out other explanations; but with significant market power it may be hard to distinguish efficiency from less innocent theories.

#### A. Background

Foreign adapters enable travelers to use electrical appliances for one country in other countries that have a different plug standard. There are about thirteen plug standards worldwide. We focus on the sale of these adapters at RadioShack,<sup>119</sup> a company that operates approximately 7,000 retail electronic stores in the United States.<sup>120</sup> Many of the items it sells are available at many other stores such as electronics super stores (e.g., Best Buy) or more general-purpose retailers (e.g., Sears), computer stores, and others. The typical RadioShack store is smaller than these other outlets.<sup>121</sup> RadioShack aims to stock hard-to-find electronics parts<sup>122</sup> to offer customers assistance in identifying the part they need,<sup>123</sup> and to have convenient locations.<sup>124</sup>

At its retail stores, RadioShack generally sells a package of four plug adapters for outlets that are used in Europe, the United Kingdom, New Zealand/Australia, and North America.<sup>125</sup> An American traveler needing plug adapters for an overseas trip would typically buy this package. RadioShack also sells an adapter for North America separately. This is what a visitor from Europe would buy if traveling to the United States. On May 8, 2002, the prices at the RadioShack store near the Boston University campus were \$2.49 for the

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119 See RADIOSHACK CORP., 2002 FORM 10K 1 (Mar. 28, 2003), <http://www.radioshackcorporation.com/ir/irfrm.html> (last visited Nov. 11, 2004).

120 About 5,000 are company-owned stores and the remainder are franchises. *Id.* at 2.

121 The average size of a store is approximately 2,400 square feet. *Id.*

122 RADIOSHACK CORP., 2001 ANNUAL REPORT 4 (2002), [http://media.corporate-ir.net/media\\_files/NYS/RSH/reports/rsh\\_041202\\_annual.pdf](http://media.corporate-ir.net/media_files/NYS/RSH/reports/rsh_041202_annual.pdf) (last visited Nov. 23, 2004).

123 *Id.*

124 RadioShack claims that 94% of people in the United States live or work within five minutes of a RadioShack store. See RADIOSHACK CORP., *supra* note 122.

125 The "European" adapter has two round prongs. The "U.K." adapter has three flat prongs arranged roughly in an equilateral triangle with the main axis of one perpendicular to the main axes of the other two. The adapter for Australia and New Zealand has two flat prongs that are not parallel. All four of these adapters have "female" connections that can take either a two-pronged, polarized North American plug or a "European" plug. The "North American" adapter in the package seems to have two possible uses. First, it can be used to convert a European plug to fit a polarized (or non-polarized) North American outlet; second, it can be used to convert a polarized North American plug to fit an unpolarized North American outlet.

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North American adapter and \$9.99 for the package of four.<sup>126</sup> Both of these packages have a RadioShack brand.

RadioShack does sell separate adapters at its web site under the "Hybrinetics" brand name.<sup>127</sup> The stand-alone prices are \$2.49 for the North American, Australia/New Zealand, and European adapters and \$4.99 for the U.K. adapter (all prior to shipping).<sup>128</sup> Consequently, the price for the package at the store is about 20% less than the sum of the prices for the stand-alone packages sold separately at the web site: \$9.99 versus \$12.46.

The market for travel adapters is highly competitive. At least ten different manufacturers make products similar to the ones discussed here,<sup>129</sup> and there are low barriers to entry in this market. A consumer in Chicago could purchase travel adapters through many different retail channels including hardware stores such as Home Depot and Ace Hardware, electronics stores such as RadioShack and Best Buy, general discount retail stores such as Target, Internet shopping sites such as amazon.com, and miscellaneous specialty shops such as travel stores and airport gift and magazine shops.<sup>130</sup> Most of these stores operate in highly competitive markets.

### B. *Explanations for Pricing and Tying*

Given the high degree of competition in the manufacture of foreign adapters, and the number of locations at which one can buy them, cost is the most plausible explanation for the packaging and pricing strategies we observe. The apparent discount for the package of four adapters relative to the sum of what the prices would be if they were sold separately is plausibly attributable to the same sort of efficiencies of packaging evident in the cold remedies case. However, the important feature of this case is not so much the pricing of the

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126 We do not suggest that this bundling is necessarily the norm for bricks-and-mortar stores and our argument in this case depends on factors that appear to be particularly relevant for RadioShack. We have seen both in practice. Internet-based stores provide a wide variety of adapters separately and in packages. See, e.g., TravelOasis, International Wall Outlet Plug Adapters Guide, at <http://traveloasis.com/elad.html> (last visited Nov. 11, 2004).

127 RadioShack, <http://www.radioshack.com> (last visited Dec. 5, 2004). We have not purchased these Hybrinetics plug adapters, so we cannot compare their features with those of the RadioShack brand. Internet-based stores provide a wide variety of adapters separately and in packages. See, e.g., International Wall Outlet Plug Adapters Guide, *supra* note 126.

128 Electrical adapters are available at a number of web sites, and the price of the U.K. adapter is generally higher than the price of the others. At the Transadapt web site, <http://transadapt.com>, the U.K. adapter was \$4, and the other three were each \$2. At the International Electrical Supplies web site, <http://www.international-electrical-supplies.com>, the price of the U.K. adapter was \$3.98 while the price of the other three was \$2.98.

129 These manufacturers show up at RadioShack, Adapters, at <http://www.radioshack.com/category.asp?catalog%5Fframe=CTLG%5F010%5F009%5F000&Page=1> (last visited Nov. 11, 2004), and MSN Shopping, Adapters, at <http://www.eshop.msn.com/marketplace.aspx?pmpType=1&pcId=7914&catID=1565> (last visited Nov. 11, 2004).

130 Home Depot, Ace Hardware, and Best Buy stores in the Chicago area were contacted on Feb. 26, 2004.

bundle as the decision not to offer the adapters separately. RadioShack stores are small but stock approximately 3,000 items. Offering four or five adapter choices would take up valuable shelf space. That has to be weighed against the demand for each of these choices, the demand for other products, and the cost of expanding shelf space.

It is possible to construct a price-discrimination explanation for the bundling and pricing. But that would require that most customers value all (or at least most) of the components at more than marginal cost. The aim of price discrimination is to capture potential surplus, which is the difference between what customers are willing to pay for a good and the marginal cost of producing it. If, for example, customers who want the European adapter do not value the Australian/New Zealand adapter at more than the marginal cost of production, there is no consumer surplus to extract. We conjecture that most people who buy adapters need only one or two. This is seen most easily for the North American and Australia/New Zealand adapters which account for half of the package. Most U.S. residents buying adapters do not need the North American one. And few would need the Australian one either. In 2001, there were nearly 12 million trips to countries where one would use the European adapter, nearly 5 million to countries where one would use the U.K. adapter, and only 1.3 million to countries using the Australian/New Zealand adapter. If we take these numbers as rough estimates of the relative demand for the different adapters, it is clear that the vast majority of people who want the European or U.K. adapters have no use for the Australian adapter.<sup>131</sup>

Leveraging theories are similarly implausible. Under these theories, RadioShack would need to have significant market power over one of the adapters, and it would then try to use that monopoly to gain an advantage in the "markets" for others. To apply the theory, one would have to identify the adapter in which it had market power and determine how it was trying to monopolize one or more of the other adapter "markets." But there is no reason to suspect that RadioShack faces nascent competition in, say, the "market" for Australian adapters. In all likelihood, easy supply-side substitutability means that the different adapters do not constitute separate antitrust markets—someone who makes and sells any one adapter can easily make and sell any other.

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131 We collected travel statistics from Int'l Trade Admin., U.S. Dep't of Commerce, U.S. Resident Travel Abroad Historical Visitation – Outbound 1991 – 2001, at [http://tinnet.ita.doc.gov/view/f-2001-11-001/index.html?ti\\_cart\\_cookie=20030310.162541.14328](http://tinnet.ita.doc.gov/view/f-2001-11-001/index.html?ti_cart_cookie=20030310.162541.14328) (last visited Dec. 5, 2001). We matched the countries with the necessary adapter from TravelOasis, International Wall Outlet Plug Adapters Guide, at <http://traveloasis.com/elad.html> (last visited Nov. 11, 2004). In principle, of course, suitably strange patterns of foreign travel could explain everything. For example, suppose that all travelers from the United States to relevant foreign countries make one trip to Australia or New Zealand, about four trips to the United Kingdom, and about nine trips to Europe. This would match the observed distribution of foreign travel, and it would match the adapters in the RadioShack package. In the real world, of course, the patterns of foreign travel have many fewer people visiting Australia and New Zealand than Europe.

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Moreover, to the extent that its motive is strategic entry deterrence, RadioShack would seem to take a bigger risk of facilitating entry into the larger "market" for the European adapter.

### C. *Implications of Foreign Adapter Bundling*

The most important feature of this case is that while the bundling discount provides some evidence of bundling efficiencies, any efficiencies are relatively modest and they are not the reason that tying occurs. Rather, it would appear most likely that the tying occurs because of the limitation on the number of distinct products that can be offered.

While the broad explanation for the tying in this case is clear, there are two features of the case that have important implications for tying doctrine. First, even if we think we understand the rationale for the general strategy, some of the details are puzzling. Given that RadioShack sells the North American adapter separately, why does it include that adapter in the package of four? Second, there are plausible alternative strategies that some customers would prefer. Indeed, simply eliminating the North American adapter from the bundle would seem to make many customers better off. The only parties who would be harmed would be those who wanted the North American adapter in conjunction with one of the foreign adapters, and the harm they would suffer would be to lose the relatively modest marginal cost savings. If courts judge the reasonableness of a tie based on whether there is evidence of substantial *marginal* cost savings and ignore the *fixed* costs of product offerings (in this case, shelf space and stocking costs), they may fail to detect the true efficiency reason that tying occurs.

### V. Optional Equipment on Automobiles

For more than a century cars have often come with optional equipment. For instance, the 1906 Ford line of cars came with optional cowl lamps, bulb horn, and three-inch wheels.<sup>132</sup> Customers could choose a car with or without each piece of optional equipment. AM/FM radios were optional on cars sold in the 1950s. Two aspects of optional equipment on automobiles make it an interesting subject for us. First, this optional equipment has become standard over time. Consumers lose the choice of buying the car without the option. Mixed bundling gives way to tying. Most cars now come with AM/FM radios as standard equipment. Second, American and Japanese car manufacturers initially pursued different strategies with respect to how much flexibility they gave customers to select optional equipment. The Japanese companies pursued a strategy best characterized as pure bundling, whereas the American companies used mixed bundling. Over a period of apparently aggressive competition in the

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132 JOHN GUNNELL, STANDARD CATALOG OF FORD 1903-2003, at 22 (3d ed. 2002).



industry, the American companies adopted a strategy that resembled that of their Japanese rivals. Thus, pure bundling emerged as the dominant strategy in a competitive process.

In this Part, we focus on three competing and popular mid-sized sedans<sup>133</sup>—the Ford Taurus, the Honda Accord, and the Toyota Camry<sup>134</sup>—to explore these phenomena. We collected data on the prices and optional equipment for these three models for 1986, 1990, and 2004.

We find that Honda and Toyota tended to bundle most features together during the entire time period.<sup>135</sup> They thereby offered a bundle that appealed to a broad range of customers, and they did not offer product configurations that appealed to narrower groups of customers. We also find that Taurus offered many product configurations in 1986 but moved closer to the Accord and Camry approach by 2004. Thus Taurus moved from mixed bundling towards pure bundling. We argue that pure bundling is efficient because it economizes on fixed costs while providing a product that appeals to a broad range of customers. More speculatively, it appears that, over the time period we considered, there was an increasing recognition that increased product variety raises production costs in real but elusive ways.

#### A. Background

Until the early 1970s, the United States automobile industry was considered a classic example of a tight oligopoly.<sup>136</sup> Four domestic firms accounted for virtually the entire market. In the 1970s, imports from Japanese and other foreign automobile manufacturers began to erode the shares held by the domestic companies. By 2003, the top three domestic makers saw their shares fall to 60%. Although the industry remained concentrated, with an Herfindahl-Hirschman index ("HHI") score of 2,350,<sup>137</sup> there have been rapid

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133 The phenomena we document here—the comparison between the Taurus on the one hand and the Accord and Camry on the other and the change in strategy with respect to the Taurus—are merely examples of more general phenomena with respect to how the strategy of United States car companies differed from those of their Japanese rivals and how they changed over time. We were surprised at how difficult it was to find published documentation of the trend. One exception is John K. Teahen & Ryan Moloney, *Ford Simplifies 2002 Mix*, AUTOMOTIVE NEWS, July 30, 2001, at 1.

134 The Camry and Taurus and, more recently, the Accord have come as station wagons. The Accord also comes as a coupe. We consider only the sedan versions. For their competitiveness with each other, see reviews such as *On the Road: Getting What You Pay For*, SAN ANTONIO EXPRESS-NEWS, Feb. 20, 2004, at 4.

135 Most cars are not made-to-order with options. Instead the manufacturers anticipate consumer demand and produce a number of different varieties including paint color. The automobile dealers can then add some options themselves. The dealers then try to match customer preferences by searching through the distribution system for a car. However, it is not necessarily possible to obtain cars with any permutation of the options offered.

136 Robert F. Lanzillotti, *The Automobile Industry*, in THE STRUCTURE OF AMERICAN INDUSTRY 274 (Walter Adams ed., 4th ed. 1971).

137 U.S. CENSUS BUREAU, CONCENTRATION RATIOS IN MANUFACTURING 16, <http://www.census.gov/prod/ec97/m31s-cr.pdf> (last visited Nov. 22, 2004). Under the Department of

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shifts in market share and entry. Price has fallen significantly with increased competition: from 1986 to 2003 the real price of cars dropped by 27%.<sup>138</sup>

The mid-sized segment is particularly competitive. The Taurus and the Camry have vied over the years to be the highest selling cars in the United States, a distinction that the companies apparently value.<sup>139</sup> We believe that the product design decisions we describe below are mainly the result of competitive forces.

### B. *Bundling and Pricing Over Time*

To document the differences in tying strategies across companies and over time, we collected data on the series and available options for the Taurus, Accord, and Camry from the *Kelley Blue Book* for 1986 and 1990 and from *Consumerguide.com* for 2004.<sup>140</sup> Table 9 reports the results. It contains a set of statistics illustrative of the differences in the strategies of the three companies in 1986 and 2004 and their trends over time.

A simple measure of the extent to which options are not tied is the number of separately available options, which is reported for each brand in Column 5. The more options, the farther the product is from pure bundling. In 1986, the Taurus, with between thirty-two to fifty options, far exceeded the single option offered on the Accord or the five to nine offered on the Camry. By 2004, the number of separately available items on the Accord and Camry had not changed much. In contrast, the number of separately available options on the 2004 Taurus had dropped dramatically. The 2004 Taurus still had more separately available options than the Accord but about the same as the Camry.

The value of options ranges dramatically. To take that into account we also report the value of the options for each car both in absolute terms and as a

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Justice/Federal Trade Commission guidelines, this would be considered a concentrated industry for which a merger would receive close scrutiny. DEP'T OF JUSTICE & FED. TRADE COMM'N, 1992 HORIZONTAL MERGER GUIDELINES, available at <http://www.ftc.gov/bc/docs/horizmer.htm> (last visited Dec. 5, 2004).

138 Based on a 1982-84 base, the values for the CPI-U and the new car price index were 109.6 and 110.6 respectively in 1986. They were 184 and 134.7 in 2003. 2004 ECONOMIC REPORT OF THE PRESIDENT tbls. B60 & B61, <http://www.gpoaccess.gov/eop/>.

139 One of these three cars has been the best selling car in America each year for at least the last decade, and they have all been near the top when they haven't won the distinction. The Taurus won in 1994, among other years. *Best in Show: Ford Taurus*, AUTOWEEK, Jan. 1995, at 16. Honda won in 2001, among other years. Press Release, Honda, Honda Accord Best-Selling Car in 2001 Regains Title After a Decade (Jan. 3, 2002) (on file with authors). Camry won in 2003, among other years. Press Release, Toyota, Toyota Announces Best Sales Year in Its 46-Year History, Breaks Sales Record for Eighth Year in a Row (Jan. 5, 2004) (on file with authors).

140 The complete list and the structure of the offerings, which are complicated, are presented in an appendix which is on file with the *Yale Journal on Regulation* and available at David S. Evans & Michael A. Salinger, *Why Do Firms Bundle and Tie? Evidence from Competitive Markets and Implications for Tying Law* (May 20, 2004) (working paper), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=550884](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=550884) (last visited Nov. 29, 2004).

percentage of the base price of the car.<sup>141</sup> The options available on the Taurus were a significant fraction of the base price of the car, and almost ten times more valuable than the options offered on the Accord. By 2004, the Taurus's option profiles were much closer to the Accord's. Toyota's strategy with the Camry appears to be between the other cars based on the value of options. While Toyota gave customers choices about a small number of features, those features tended to be of high value. One prime example is an air conditioner, for which the MSRP in 1990 on the Camry was \$825. Also, in 2004, each Camry model had an optional V6 engine that was available as a separate item.

**Table 9. Summary of Models and Options Available for Selected Cars**

Year	Car Type	Number of Models	MSRP (\$)	Number of Options	Total Price of Options (\$)	Option Price/ Base Price
1986	Ford Taurus	3	10,170 - 13,838	32 - 50	4,784 - 8,079	35% - 79%
	Honda Accord	3	10,238 - 13,998	1	500	4% - 5%
	Toyota Camry	2	10,198 - 11,738	5 - 9	2,025 - 4,080	20% - 35%
	Ford Taurus	4	19,830 - 23,625	3 - 13	1,185 - 4,050	6% - 19%
2004	Honda Accord	6	15,900 - 26,890	0 - 2	800 - 2,800	0% - 12%
	Toyota Camry	3	19,875 - 22,295	9 - 12	6,003 - 6,598	30% - 31%

Source: *Kelley Blue Book* (1986); *Consumerguide.com* (2004).

Over the period covered by this study, competition among the three cars was increasingly intense. Honda and Toyota added production facilities in the United States. Thus, if their tying strategies were originally driven by higher transportation costs and longer delivery lags, one might expect that they would have begun to offer customers more flexibility in their selection of options. Yet that did not happen. In 2004 Honda's strategy with respect to the tying of options was virtually identical to its strategy almost twenty years earlier.<sup>142</sup> An

<sup>141</sup> Prices are based on Manufacturers Suggested Retail Price ("MSRP").

<sup>142</sup> To be sure, Honda's strategy became somewhat more complicated, particularly for its higher end model. In 2004, there still were nominally three series. Yet the middle series was available with a more powerful engine. In turn, that engine was tied to other features. The highest-end model had a set of tiered options that could be added.

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automatic transmission was the only separately available option on the base model. Ford's strategy changed dramatically, however. For example, in 1986, air-conditioning was a stand-alone option on the Taurus. In 2004, it was standard equipment on the base model.<sup>143</sup> That is, it was tied to the car itself (as opposed to other optional equipment).

Looking behind these broad measures provides further insight into the nature of bundling. In 1986, the only separately available option on each Accord series was an automatic transmission. Each higher-end series included a set of features not available on the most basic model. A customer who wanted an AM/FM radio on her Honda had to get it with a cassette player and, more significantly, air conditioning and six other features. The package containing the AM/FM radio cost \$2,100—the difference between the mid-level and entry-level model. In contrast, a customer could get an AM/FM radio on her Taurus for \$157—she could just get the base model with a radio and no other options.

The difference between the mid-level Honda Accord and the most expensive one provides similar examples. To take just one, to get the more powerful engine that came with the high-end Honda, a customer had to get a power moon roof for a total price of \$1,660. But the Taurus customer could get either a more powerful engine for \$672 or a power moon roof for \$701 or both—an example of mixed bundling.<sup>144</sup> Remarkably, not even a radio was a tied option on the Taurus in 1986. While an AM radio was nominally standard equipment, all three Taurus models had a "Radio Delete" option that resulted in credit.<sup>145</sup>

### C. Sources of Bundling Economies

We now consider the role of marginal cost savings, fixed costs, and the heterogeneity of demand in the bundling decisions we describe above. We begin by presenting some rough estimates of marginal cost savings and then discuss the evidence concerning fixed costs.

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143 Other features that had previously been optional and were now tied to the base model were a V6 engine, tilt steering wheel, power windows, power door locks, and intermittent wind-shield wipers.

144 The LX had two additional features: custom alloy wheels and a front and rear stabilizer bar. On the Taurus, there were two separately available options on wheels. The prices for styled road wheels were \$178 on the L and GL and \$113 on the LX. The prices for the cast aluminum wheels were \$390 on the L and GL and \$326 on the LX. KELLEY BLUE BOOK (1986).

145 It is our understanding from knowledgeable sources that the strategies of Honda and Toyota were a consequence of the higher transportation costs and longer delivery lags associated with importing from Japan. The logistics of delivering a car with specially ordered features were apparently simpler and less expensive within the United States. Another important institutional feature is that the Japanese manufacturers operated under voluntary import restraints during some of this period. While import restrictions quite plausibly affected the price the companies charged for each car and the mix of cars, it is not clear why they would affect tying behavior.

### 1. Marginal Cost Savings

We attempt to infer marginal costs of options by comparing the price of bundled offerings with the sum of the prices of the components of the bundles. This technique provides some insights but the numbers are likely confounded by price discrimination. We begin by comparing the Honda Accord and Ford Taurus in 1986. The extra features that came with the most luxurious Accord, the LX, could be purchased separately on the Taurus for \$1,945. This sum is a slightly less than the incremental cost of buying the Accord LX rather than the mid-level Accord, the DX. Thus, this comparison provides no evidence of substantial savings from bundling, or at least no savings passed on to the consumer.

In addition to offering options separately, Ford had two tiered bundles of options available on each of the three series in 1986. The pricing of these packages provides another opportunity to look for evidence of bundling efficiencies. For the base package, the discounts were 6.1%, 15.1%, and 22.9% respectively on the entry-level, mid-priced, and deluxe models. For the premium package the discounts were 3.8%, 14.6%, and 24.1%. Particularly on the Taurus LX, the highest-end series, these discounts are substantial. Given how variable the discounts are, however, we suspect that the larger discounts reflect price discrimination.<sup>146</sup> We next turn to changes in the cost of options on the Ford Taurus between 1986 and 1990. The 1990 entry-level Taurus included three features that were not available in 1986 (including a driver's side air bag), two features that had been standard on the mid-priced model but not available separately on the entry-level model, and eight features that had been available separately on the entry-level model. Between 1986 and 1990 the price of the entry-level Taurus increased by \$2,925 in nominal dollars, or \$1,265 in 1986 dollars. We have estimated that the value of the eight items available separately in 1986 and included as standard equipment in 1990 plus the driver's side air bag to have been \$1,637 measured in 1986 dollars.<sup>147</sup> These figures are close enough (particularly in light of the inherent imprecision of inflation adjustments) to conclude that the increase in the inflation-adjusted price of the Taurus was largely attributable to the additional features.

The fact that the inflation-adjusted price increased somewhat less than the value of the additional features might reflect some marginal cost savings. Even if it does, however, those economies are modest and cannot be said to be a central rationale for the increased tying.

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<sup>146</sup> That is, the price differences do not reflect cost differences.

<sup>147</sup> The sum of the prices of the eight items available separately in 1986 and standard in 1990 was \$925. As these prices are in 1986 dollars, no inflation adjustment is needed. We could not find a year when a driver's side air bag was a separately available item on the Taurus. In 1989, however, it was a separately available item on the Ford Tempo, and the price was \$815 in 1989 dollars or \$712 in 1986 dollars.

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An examination of the nature of the features reinforces this conclusion. Honda, for example, tied a more expensive sound system to an air conditioner. There is no obvious reason why the marginal cost of adding an air conditioner to a car should be less if the audio system has an FM radio and a cassette player.

As we have already noted, there has been a general trend in the automobile industry of increased tying as equipment that was once optional becomes standard. In some cases, this occurs because an item becomes too cheap to justify charging separately. This might well be the case with some electronic items like FM radios. But reductions in the cost of the option cannot explain all the increase in tying over time that we observe. Ford's decision not to offer the Taurus without air conditioning, which is a far more expensive item, is an example.

### 2. Product-Specific Scale Economies

The literature on activity-based costing argues that to offer many different products increases costs in real but hard-to-document ways. In a key article, Cooper and Kaplan describe the hypothetical case of two plants that produce the same number of pens: one produces one color and the other several colors. They conjecture:

Despite the similarities in product and total output, a visitor walking through the two plants would notice dramatic differences. Plant II would have a much larger production support staff—more people to schedule machines, perform setups, inspect items after setup, receive and inspect incoming materials and parts, move inventory, assemble and ship orders, expedite orders, rework defective items, design and implement engineering change orders, negotiate with vendors, schedule materials and parts receipts, and update and program the much larger computer-based information system. Plant II would also operate with considerably higher levels of idle time, overtime, inventory, rework, and scrap.<sup>148</sup>

Several studies examined whether automobile manufacturing incurs such product complexity costs.<sup>149</sup> Fisher and Itner studied the effects of option variability on costs based on data collected at the Mazda Hiroshima plant in 1991.<sup>150</sup> They found that option variability increased the amount of rework needed, increased the level of inventories, and increased production downtime. They concluded that reducing option variability by 10% saved roughly one hour of manufacturing labor per car.<sup>151</sup> This savings might seem modest, but note that the change in Ford's strategy with respect to options drastically

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148 Robin Cooper & Robert S. Kaplan, *Measure Costs Right: Make the Right Decisions*, 88 HARV. BUS. REV. 96 (1988).

149 S.W. Anderson, *A Framework for Assessing Cost Management System Changes: The Case of Activity Based Costing Implementation at General Motors, 1986-1993*, 7 J. MGMT. ACCOUNTING RESEARCH 1 (1995).

150 Marshall L. Fisher & Christopher D. Itner, *The Impact of Product Variety on Automobile Assembly Operations: Empirical Evidence and Simulation Analysis*, 45 MGMT. SCI. 771 (1999).

151 *Id.* at 782.

reduced the number of distinct options available and could well have reduced variability in options by much more than 10%.<sup>152</sup>

Moreover, the cost of product complexity documented in the studies cited above reflect only manufacturing costs. Fisher et al. found that product complexity increased costs of the distribution system as customers found it difficult to locate the cars that they wanted.<sup>153</sup> Thus, there seems to be evidence that product complexity due to option flexibility increased costs in ways that were not well understood in 1986. The increased amount of tying that has occurred since may be attributed to this effect.

### 3. Alternative Explanations

Price discrimination is common in the automobile industry, but it is not a plausible explanation for Honda's tying strategy or the change in Ford's over time. While under some circumstances tying can increase profits relative to pure components selling, theories of bundling as a form of price discrimination predict that mixed bundling can lead to even higher profits.<sup>154</sup> Indeed, by tying more options together, Ford reduced its ability to engage in price discrimination through mixed bundling.

Strategic leveraging explanations do not make sense here. The companies that initiated the strategy of tying were not the incumbents but the entrants. It is implausible that Ford tied<sup>155</sup> its cars to radios (by not allowing customers to delete the radio and get a price reduction) to monopolize the radio market or prevent radio manufacturers from evolving into a threat to its car manufacturing business.<sup>156</sup>

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152 See John Paul MacDuffie et al., *Product Variety and Manufacturing Performance: Evidence from the International Automotive Assembly Plant Study*, 42 MGMT. SCI. 350 (1996).

153 Marshall Fisher et al., *Strategies for Product Variety: Lessons from the Auto Industry*, in REDESIGNING THE FIRM 116 (Edward H. Bowman & Bruce M. Kogut eds., 1995).

154 See McAfee et al., *supra* note 50.

155 We are using tied in the economic sense of bundling components together. It seems counterintuitive that a car with a radio consists of two tied products rather than a single integrated product. However, two points are noteworthy. First, the economics of bundling helps explain why components become integrated—notably radios were not always integrated with cars. Second, the legal analysis of bundling focuses on whether there is demand for a component separately from the bundled product and if there is concludes that the bundled product is two products rather than one. The economics of bundling helps explain why that reasoning is wrong as we discuss below.

156 One other strategic factor one might consider is that there is an extensive literature on factors that facilitate collusion. See F. M. SCHERER & DAVID ROSS, *INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE* (3d ed. 1990). One of the factors that makes collusion difficult is the complexity of the product offerings. The tying strategy does simplify the offerings, so one might hypothesize that the intent is to maintain pricing discipline. Despite the convergence among the strategies of the three companies, they still have distinct differences that would seem to leave in place any concerns that details of the pricing of options could be used to circumvent a tacitly collusive agreement.

D. *The Difficulty Identifying the Sources of Efficiencies*

If price discrimination and leveraging does not motivate the observed tying, then cost savings are the most likely explanation. As noted above, though, there is no apparent marginal cost savings from bundling. However, the car industry does experience the same sort of product-specific fixed costs present in the adapter case, whether or not they are obvious. Quantifying these efficiencies is difficult because it requires the sort of detailed internal cost information that is not publicly available. Even if they were it is not clear that one could isolate and measure cost savings from analysis of such data.

There is more tying of options in the automobile industry than there once was: features that used to be options are often now standard equipment. The cost of these additional features increases the price of cars. Those customers who want plain cars are harmed as a result. We doubt that many Taurus buyers in Houston would want to do without air conditioning, but there might well be car buyers who live in cooler climates who feel no need for it.

Studies for understanding the costs of product complexity are imperfect and controversial.<sup>157</sup> They are also costly. Published evidence about the issue likely exists for the automobile industry because it is the largest manufacturing industry in the world and the stakes are so high. There might be other businesses where the evidence is not collected but decisions are made because managers believe that product complexity increases costs.

The importance of this case is that it documents *increased* tying that occurred under competition. Of course, it did not occur under perfect competition, and there are enough complications in the case that others might push alternative explanations. In our view, though, the cost basis for tying is by far the most likely. Tying occurred not to segment markets or to foreclose independent parts suppliers. It occurred because Ford realized that the cost of variety was too great and that its attempts to provide each customer exactly what he or she wanted made Ford less able to meet the needs of what most customers wanted. Just as RadioShack had to limit its product offerings, so did Ford.

VI. Competitive Tying and Its Lessons

Tying is common in competitive markets. It results in lower costs for producers—which get passed on to consumers—or greater convenience, which benefits consumers directly. But these cost savings for producers and consumers are not necessarily easy to document. The price discounts in over-the-counter cold medicines provide persuasive evidence that there can be significant cost savings from bundling. But we were able to document that in large part because

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<sup>157</sup> See, e.g., Christopher D. Ittner et al., *The Association Between Activity-Based Costing and Manufacturing Performance*, 40 J. ACCT. RES. 711 (2002).



the sellers did not tie—they offered products separately as well as combined. The cost savings are harder to establish in foreign electrical adapters or in other cases of pure bundling. The savings in packaging costs that presumably result in RadioShack tying all the adapters together in a single bundle may be quite modest; this evidence might not meet the court of appeals' skeptical view of proffers of efficiency evidence in *Jefferson Parish*. The same is true for automobiles. The most plausible explanation is that limiting the possible product variants reduces costs. But it is not clear that even a detailed investigation of automobile manufacturing would provide definitive evidence. In the latter two cases, we believe the cost savings explanations in part because we do not believe alternative explanations, such as anti-competitive foreclosure, which we can rule out because of the structure of these industries.

Our competitive theory of tying shows that the explanations for tying can be subtle in some situations. Marginal cost savings from packaging or other factors can result in bundling. In pharmaceuticals we saw that savings resulted in mixed bundling but not in tying.<sup>158</sup> But such savings are neither necessary nor sufficient to predict tying. Firms engage in tying when doing so reduces the fixed costs of offering one or more components separately. Such product-specific scale economies provide a plausible explanation for the pure bundling we observed in the foreign-adaptor case (shelf space is the fixed cost) and the increased pure bundling we observed in the mid-sized automobile case (where product-specific scale economies arise from complexity).

#### A. *Implications for Tying Law*

The modified per se rule is not based on any generally accepted theory of how tying could harm competition or consumers. But it seems to be founded on two premises. The first premise is that denying consumers the choice of buying the tying product without the tied product is bad, while choice is good. The second premise is that when dominant firms deny consumers a choice they must be doing it to leverage their monopoly into the tied market or to protect their monopoly in the tying market. Otherwise they would not make consumers take something they do not want.

Our analysis shows that both premises are wrong, both theoretically and empirically. The first premise wrongly assumes that product choice is free. Businesses incur fixed costs when they make and distribute products. Adding a choice can result in lower consumer welfare in addition to lower producer welfare, as our theory has shown. This point is empirically clear—there are many product choices that some consumers would like to have that they cannot

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<sup>158</sup> At least not tying in the direction that would concern the antitrust laws. CVS engaged in mixed bundling. The brand-name producers sold the brand-name product separately plus a bundle that included a generic version of the other brand-name product. Neither brand-name company sold a generic version of the other brand-name product separately.

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get, but businesses cannot always offer those choices profitably at prices that those consumers would be willing to pay.

The second premise, that tying is often used to leverage a monopoly into an adjacent market, is wrong because tying is common in competitive markets and therefore a source of efficiency. Our case studies show that in foreign electrical adapters and mid-size sedans reducing fixed costs was the most credible explanation for tying. That is not to say that tying could not be anticompetitive, but the economic theories we reviewed earlier show that even monopoly firms have the motive and ability to use tying for anticompetitive purposes only in quite special circumstances.

As a matter of theoretical and empirical economics, the modified per se test is not capable of identifying anticompetitive tying except by happenstance. The single-product test, which examines whether the tying and tied good are part of a "single product," is not a reliable proxy for examining whether there are efficiencies or not. Although there may be a demand for the tied product separately (e.g., shoe laces) it may be inefficient to provide the tying product (e.g., shoes) separately.<sup>159</sup> Thus, the efficient offering may be the bundle, which is the subject of legal concern, and the tied product. That is the case with foreign electrical adapters where RadioShack stores offer only a bundle of four adapters, any one of which can be purchased separately on the web. The coercion prong of the modified per se test is flawed as well. The decision not to offer a particular product configuration is routine, as we have seen, so there is no basis for presuming that coercion is a source of anticompetitive harm.<sup>160</sup>

At least three alternatives to the modified per se test have been proposed: First, keep the test but permit the defendant to offer an efficiency defense.<sup>161</sup> Second, replace the modified per se test with a rule of reason<sup>162</sup> allowing an explicit balancing of efficiencies against anticompetitive effects. Third, replace the modified per se test with a structured rule of reason where a series of screens focus on situations where the defendant has the ability and incentive to act anticompetitively. The final step of the structured rule of reason involves a balancing of anticompetitive effects and efficiencies.<sup>163</sup>

In all three cases the empirical evidence reported above cautions against imposing too heavy a burden on defendants to establish efficiencies. We have seen that even in competitive industries where we are confident that efficiencies

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159 Areeda observed the logical inconsistency in the single-product test. 10 AREEDA, *supra* note 39, at ¶ 1745(d)(2).

160 These same considerations apply whether the tie is based on a contract, a distribution arrangement, or integration. However, the form of the tie is a factor that should be considered in assessing efficiency and anticompetitive explanations.

161 In the EU, the defendant can offer an objective justification for the practice. JONATHAN FAULL & ALI NIKPAY, *THE EC LAW OF COMPETITION* 3.208-3.209 (1999).

162 The D.C. Circuit found that the rule-of-reason approach was more appropriate than the per se approach in the particular factual circumstances of software platforms. *Microsoft II*, *supra* note 24.

163 Ahlborn et al., *supra* note 2; Evans et al., *supra* note 20.

are the only plausible explanation for the practice, solid empirical evidence is not easy to produce. Suppose the firms in either the foreign adapter or mid-sized automobile cases had monopoly power. A finder of fact, looking only at the evidence in those particular cases, might worry that the efficiency explanations were being put forward as a pretext. Taken on their own terms, and ignoring the competitive structure of the industries, our efficiency explanations are, perhaps, no more persuasive than the efficiency explanation that was rejected by the Fifth Circuit and ignored by the Supreme Court in *Jefferson Parish*.

Our theoretical and empirical results therefore suggest that alternative rules that consider efficiencies should not impose too heavy a burden on the defendant. For a structured rule-of-reason approach, we recommend the following. Plaintiffs should have to show that the defendant has the incentive and ability to use tying to foreclose competition. As part of their responses, defendants could put forth an efficiency defense just as they do now under the rule of reason and the objective justification standard used in the EU.<sup>164</sup> Once the defendant has put forward a plausible efficiency defense, the plaintiff would have the burden of showing that the defense is pretextual.<sup>165</sup> In those circumstances where there is a plausible anticompetitive theory of tying as well as efficiencies, the last step of the rule-of-reason analysis would weigh the benefits from efficiency against the claimed anticompetitive foreclosure effects.

#### B. *Application to Cases*

In *Jefferson Parish*, the Supreme Court considered whether a hospital's exclusive contract with an anesthesiology practice constituted an illegal tie. The district court concluded that it did not, because the practice was efficient.<sup>166</sup> The Fifth Circuit rejected at least some of the efficiencies and ruled that the tie violated the per se prohibition on tying.<sup>167</sup> The Supreme Court found for the hospital, not because the tie was efficient, but because the hospital operated in a

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<sup>164</sup> See, e.g., Case C-333/94 P, *Tetra Pak Int'l SA v. Commission*, 1996 E.C.R. I-5951., ¶ 37 ("Consequently, even where tied sales of two products are in accordance with commercial usage or there is a natural link between the two products in question, such sales may still constitute abuse within the meaning of Article 86 unless they are objectively justified."). See also Case T-219/99, *British Airways PLC v. Commission*, 4 C.M.L.R. 19 (2004), ¶¶ 271, 284, where the Court of First Instance begins its analysis of British Airways' pricing scheme with the question "whether those [rebate] schemes were based on an economically justified consideration," and later concludes "[the rebate schemes at issue] cannot be regarded as constituting the consideration for efficiency gains or cost savings . . . ."

<sup>165</sup> Dolman and Graf argue that the defendant should also have to show that it cannot achieve the efficiencies through less restrictive means. Dolmans & Graf, *supra* note 34, at 236. In practice, it is hard enough to document efficiencies, much less establish that they are being achieved through the least restrictive method. Evans & Padilla, *supra* note 34.

<sup>166</sup> *Hyde v. Jefferson Parish Hosp.*, 513 F. Supp. 532, 544 (E.D. La. 1981).

<sup>167</sup> *Hyde v. Jefferson Parish Hosp.*, 686 F.2d 286, 294 (5th Cir. 1982).

competitive market.<sup>168</sup> This was the right outcome, but the wrong reason. It ruled for the hospital only because it operated in a competitive market. In concluding that surgical and anesthesiology services were separate products, it implicitly dismissed evidence in the record of efficiencies from tying. But nothing in the record of the case suggests that the underlying economic analysis (if there was any) was sufficient to arrive at that conclusion.

The evidence may have demonstrated that there was some demand for the hospital's services without the hospital's anesthesiologists, but the extent of any such demand was unknown.<sup>169</sup> Moreover, there was no serious assessment of the costs to the hospital of unbundling anesthesiology services. The Supreme Court relied on the court of appeals' casual dismissal of claimed efficiencies. As noted above, our cost-based theory of bundling shows it is important to examine the practices in competitive markets and assess the demand for all of the possible product configurations. The Court's test did not enable it to receive evidence that consumers overall were harmed by the tying by the hospital.

*Tetra Pak II* is one of the major tying cases decided under Article 82 of the EC Treaty.<sup>170</sup> As with *Jefferson Parish*, the decision is not based on sound economic reasoning. Tetra Pak is an international packaging company with a very large share of the aseptic packaging business in many European countries, and a more moderate share of the non-aseptic packaging business. It faced entry into the aseptic packaging business in Italy. The Commission complained about a number of practices, one of which was Tetra Pak's requirement that customers take systems that included the packaging equipment and cartons. It also objected to Tetra Pak's requirement that it be allowed to inspect, repair and maintain the equipment; in fact, Tetra Pak reserved the right to inspect the machines without notice.

As with *Jefferson Parish*, Tetra Pak's efficiency explanation for the practice was quickly dismissed. The company claimed that its system-related requirements were necessary to reduce its exposure to products liability and to ensure public health.<sup>171</sup> The Commission dismissed this explanation on the

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168 See *supra* Section I.A.

169 According to the Court,

The evidence indicates that some surgeons and patients preferred respondent's services to those of Roux, but there is no evidence that any patient who was sophisticated enough to know the difference between two anesthesiologists was not also able to go to a hospital that would provide him with the anesthesiologist of his choice.

*Jefferson Parish Hosp. v. Hyde*, 466 U.S. 2, 30 (1984).

170 See Case C-333/94 P, *Tetra Pak Int'l SA v. Commission*, 1996 E.C.R. I-5951; Case T-83/91, *Tetra Pak Int'l SA v. Commission*, 1994 E.C.R. II-755; Case IV/31.043, *Tetra Pak II*, 1992 O.J. (L 72) 1.

171 As the Commission described, In addition to the economies of scale and cost savings at the level of raw materials and distribution which may result from stable relations with customers over a long period, the exclusive purchasing obligation is, in Tetra Pak's view, justified for technical reasons, considerations of product liability and health, and by the need to protect its reputation . . . .

grounds that Tetra Pak could achieve the same objective through less restrictive means.<sup>172</sup> But this analysis ignores transaction costs. Tetra Pak systems were used to package food. Misuse presumably could have resulted in tainted food and, as a result, illness or even death in large numbers. A court might well have had trouble assessing fault and, as a result, Tetra Pak could have faced liability.<sup>173</sup> Moreover, Tetra Pak's future sales could have been affected if packagers lost confidence in its systems. Less restrictive means might in fact be harder to enforce. For example, one might argue that Tetra Pak should establish specifications for cartons used on its machines but then allow its customers to purchase any cartons that met the specifications. Tetra Pak could not, however, simply assume that its customers would abide by the agreement. It would have to monitor purchases of supplies. It would also have to set up a certification system for carton suppliers to become "qualified suppliers" and it would have to monitor the suppliers' performance to make sure that they maintained their standards.

Our point is not that Tetra Pak had a valid efficiency justification. It could have been a pretext for engaging in a massive price discrimination scheme or an attempt to foreclose entry into aseptic packaging schemes.<sup>174</sup> Rather, we view

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On the question of health, Tetra Pak considers that, in view of the specific interactions between the machines and the packaging intended for them, only the use of Tetra Pak cartons can prevent the emergence of public health problems which might prove extremely detrimental to the consumer, above all in the aseptic sector.

Case IV/31.043, Tetra Pak II, 1992 O.J. (L 72) 1, ¶ 118.

<sup>172</sup> *Id.* at ¶¶ 119-120. This position was endorsed by the European Court of Justice in Case T-83/91, Tetra Pak Int'l SA v Commission, 1994 E.C.R. II-755.

The technical considerations and those relating to product liability, protection of public health and protection of its reputation put forward by Tetra Pak must be assessed in the light of the principles enshrined in the judgment in Hilti v Commission . . . in which the Court of First Instance held that it was 'clearly not the task of an undertaking in a dominant position to take steps on its own initiative to eliminate products which, rightly or wrongly, it regards as dangerous or at least as inferior in quality to its own products.'

*Id.* at ¶¶ 136-140. The court reaffirmed its position in Case C-333/94, Tetra Pak Int'l SA v. Commission, 1996 E.C.R. I-5951.

It must, moreover, be stressed that the list of abusive practices set out in the second paragraph of Article 86 of the Treaty is not exhaustive. Consequently, even where tied sales of two products are in accordance with commercial usage or there is a natural link between the two products in question, such sales may still constitute abuse within the meaning of Article 86 unless they are objectively justified. The reasoning of the Court of First Instance in paragraph 137 of its judgment is not therefore in any way defective.

*Id.* at ¶ 37.

<sup>173</sup> For example, under German law, the machine manufacturer may be held liable for damages a consumer has suffered due to tainted food if (i) the latter establishes that the food or its packaging was defective, (ii) that this has caused damage, and (iii) the machine manufacturer is not able to prove that the machine was not defective and thus cannot have contributed to the damage. In addition, the manufacturer of a primary product may be held liable if he does not sufficiently supervise the further use of his product and issues warnings if his product turns out not to properly interact with certain secondary products, even if the primary product was verifiably not defective. Entscheidungen des Bundesgerichtshofes in Zivilsachen [BGHZ] 99, 167 (Case IV ZR 65/86, Decision of December 9, 1986).

<sup>174</sup> Nalebuff and Majerus label *Tetra Pak* as "the poster child for anticompetitive bundling, tying, and portfolio effects." BARRY NALEBUFF & DAVID MAJERUS, BUNDLING, TYING, AND PORTFOLIO

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*Tetra Pak* as an example in which a plausible efficiency defense was rejected on grounds that ignore commonplace contracting problems. In practice, the efficiency defense is neutered through dismissive claims that the efficiencies are not important or could be achieved in other ways.

### VII. Conclusion

Tying is common under competition. Product-specific scale economies are a major factor in making tying efficient. By limiting product selection—for example, by refusing to sell the tied good without the tying good—firms can reduce overall costs. The product-specific scale economies that give rise to tying under competition are just as likely to be present and to result in tying when firms have market power. Like other practices that are common under competition, tying should be treated under the rule of reason. The fact that product-specific scale economies are not easy to document in practice, together with the fact that tying is presumptively efficient, leads us to argue that defendants should not bear too onerous a burden of proving efficiencies.

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EFFECTS: PART 2, CASE STUDIES, at 16 (U.K. Dep't of Trade & Indus., DTI Economics Paper No. 1, Feb. 2003). The apparent basis for the claim is that *Tetra Pak's* behavior was broadly consistent with economic models of tying as a metering device. Their extreme conclusion is unwarranted for several reasons. First, as a matter of logic, behavior that is consistent with a particular economic model cannot prove that the model provides the explanation. One has to rule out the plausible alternatives which, in this case, have to include efficiencies. Second, even if they are correct about the motive, pricing schemes of this sort are not necessarily harmful to consumers. See Robert D. Willig, *Pareto-Superior Nonlinear Outlay Schedules*, 9 BELL J. ECON. 56 (1978).